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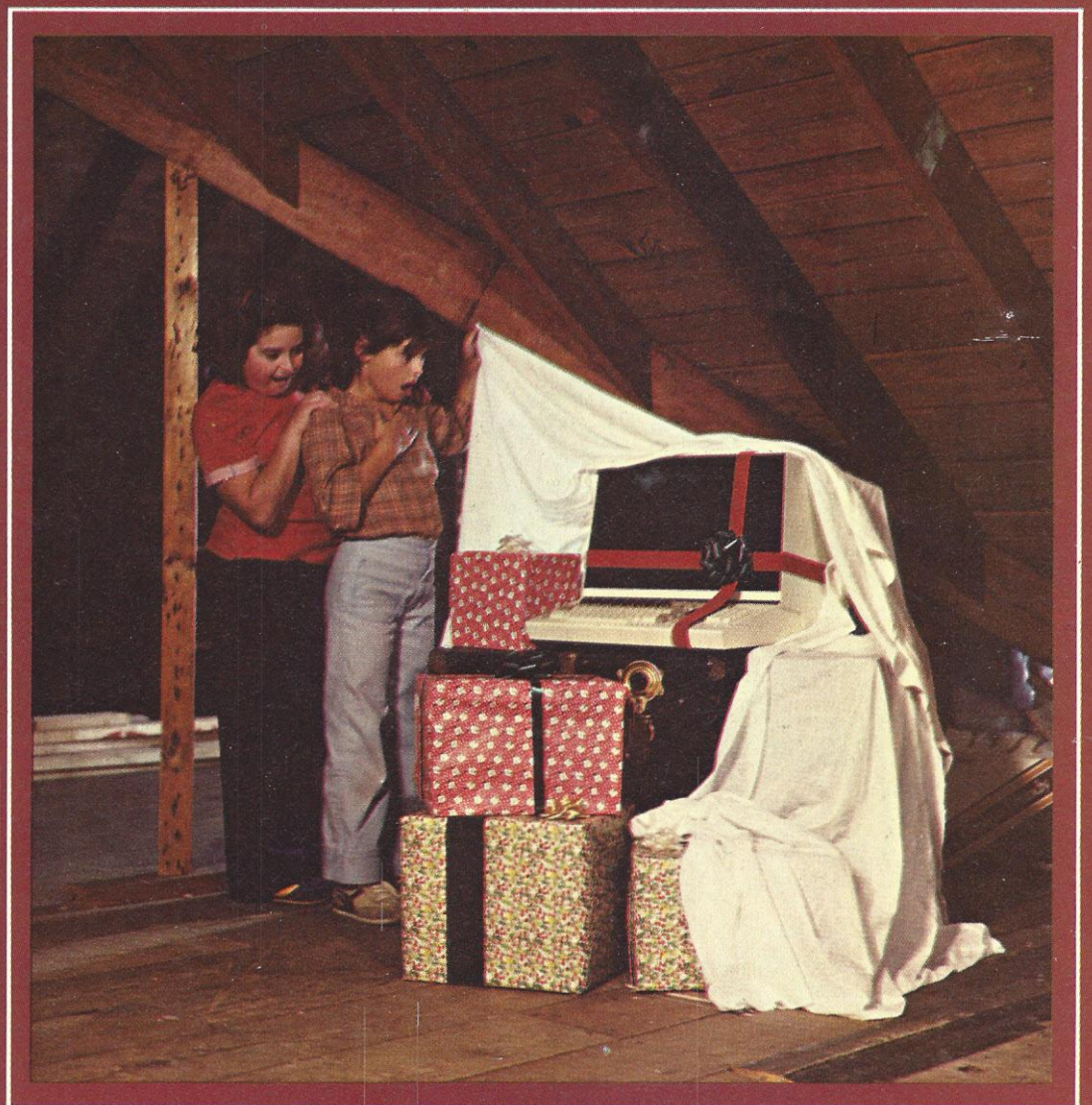

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CIRCLE 3

Personal Computing

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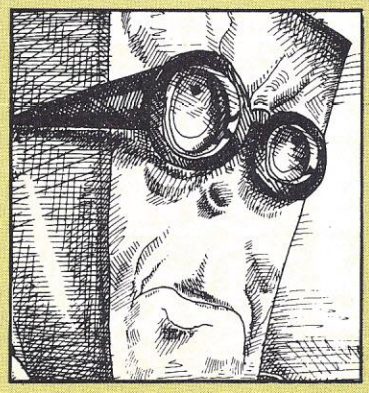

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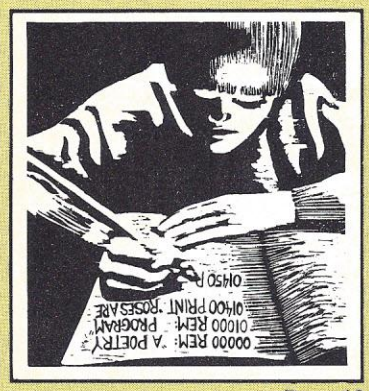

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CIRCLE 4

Personal Computing

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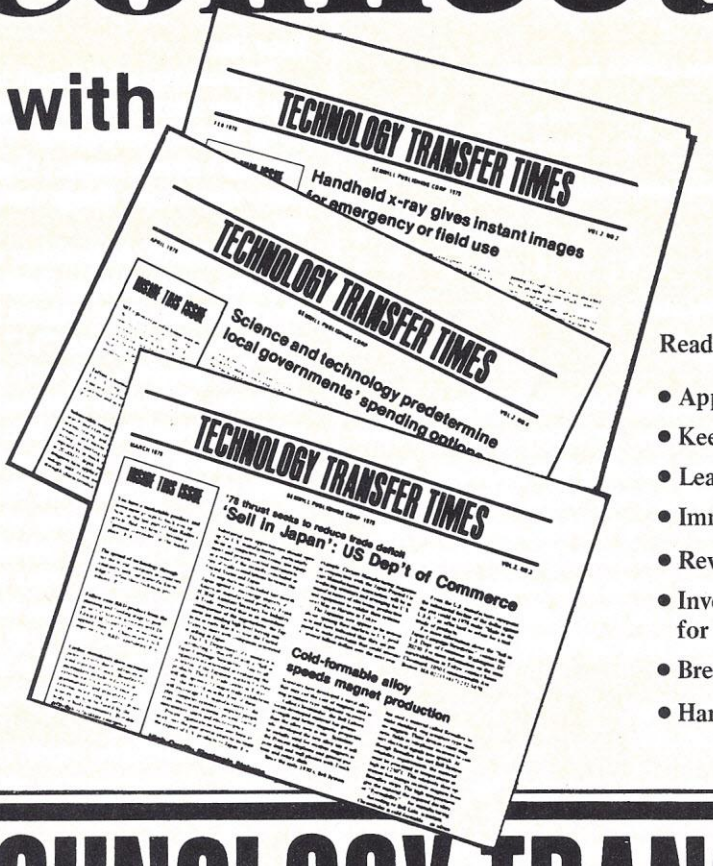

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CIRCLE 7

FEEDBACK

Petals Around the Rose Revisited Revisited

Dear Editors:

If someone makes a mistake typing my PETALS program of the July issue, they may end up playing a nonsense game. To make matters worse, they may not know from the program's behavior that the game is not the real McCoy. May I suggest the following method of verifying the program. Add a new line:

```
1 LET A = -1
```

and temporarily change lines 190 and 720:

```
190 LET A = A + 1
720 LET B = B + 1
```

Then RUN the altered program and guess 0 each time. The game that it plays will check out all the subroutines and it should look like Figure 1.

```
DO YOU WISH INSTRUCTIONS (1=YES, 0=NO)? 0
O             O         O
            O                   O         O
    O     O           O

GUESS THE SCORE? 0 NO, IT'S 22

O   O     O   O     O O'O     O   O     O
  O         O                 O   O       O
O   O     O   O     O O O.    O   O         O

GUESS THE SCORE? 0 NO, IT'S 16

O   O     O   O     O   O     O   O     O   O

O   O     O   O     O   O     O   O     O   O

GUESS THE SCORE? 0 NO, IT'S 10
```

Figure 1

Of course, the altered program does not play the bona fide game but its correct running will insure that the program is not sick. Then, when you delete line 1 and carefully return lines 190 and 720 to their original condition, you can be confident that you are really playing Petals Around the Rose.

Ken Jackman
Berkeley, CA

PET Bee Stings

To the editor:

The program for the "Spelling Bee" in your September issue will not run correctly as it is presented in the article. In order to present the student with a total of 4 chances at a misspelled word, these lines should read as:

```
330 If F=4 then 100
360 GOTO 120
```

Not only is this a very useful program for children learning their weekly spelling lists, but I'm sure many adults who have difficulty spelling would find this a usable program also.

Connie Norheim
Fargo, ND

Editor's note: You are quite correct that the Spelling Bee program will not run properly as listed in the magazine. The fix you suggested will indeed permit the program to run. After each wrong answer, the computer will print "The word was CAT not DOG" (or whatever), then give the user another try. This process will continue until the word is spelled correctly or all the allotted tries are used up. Note, however, that your line 330 sends control back to line 100, while F (the number of tries) is initialized to zero in line 5. Therefore, no matter how many times the user tries to spell the second word, F will never again equal 4; even if the word is spelled correctly, line 200 will send control back to line 100. In other words, as long as F is initialized at line 5, the program will not run correctly for any word after the first.

Program author Michael Tulloch and the *PC* staff came up with the following changes to make the program run as originally intended. First, change line 5 to read "5 A = 20" (the author's intended value for this variable). Insert "105 F = 0." Change line 330 to read "330 IF F < 4 THEN 120", and leave line 360 as it was in the printed listing ("360 GOTO 100").

With these changes, the program will permit four tries before going on to the next word, and will print "The word was CAT not DOG" only after the fourth incorrect response, as the author intended. – *D.W. & G.D.*

Barrett's Bug

Dear Sir:

TRS-owners might want to know that they have at least one bug in their Level I BASIC interpreter. They shouldn't always suspect their hardware when funny things start happening.

I discovered the problem quite by accident while playing Radio Shack's own Blackjack game. About to choose a hit or stay, I indexed "11" instead of "1". The program correctly rejected the entry. However, Blackjack blew up once the proper number had been entered. I then found that the first line of the program, including the line number, had been overwritten with data!

Fearing the worst, I visited two local Radio Shacks in order to try to reproduce the problem on their machines. I succeeded, on both 4K and 16K systems and with *their* Blackjack tapes. So the bug appeared to be a firmware problem.

After a few hours work, I isolated the error to the following routine:

```
10 F. M=1 to 1
20 IN. X
30 ON X G. 1400, 1500
40 G. 20
1400 P. "OK"
1500 N.M: P. "OK"
```

Start the above program. Index "11", ENTER. Then index "1", ENTER. If you list the program upon its completion, the first line (10) should contain garbage.

The bug arises because an ON GOTO (or ON GOSUB) instruction is nested within a FOR loop. Everything works okay unless the variable used by the GOTO contains a value outside the expected range of branch addresses. The solution is to verify that value with IFs before the ON GOTO.

Gary L. Barrett
Oaks, PA

Editors' Note: Barrett's Bug messes up programs in Texas the same as in Pennsylvania. We checked with Radio Shack's customer service office in Ft. Worth. They'd never seen this particular problem before, and quickly tried

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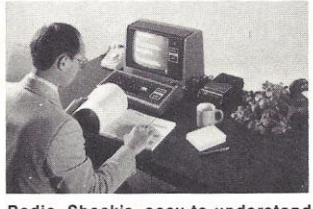

Radio Shack's easy-to-understand 232-page programming manual is included at no extra cost.

A Chicago area newspaper columnist (June 1) puts it like this. Headline: "TRS-80 best of home computers." Later he writes: "Radio Shack's TRS-80 is a 'best buy' in every sense. It offers you a keyboard that's similar to a typewriter . . . a display screen as well as a cassette recorder . . . components normally hundreds of dollars extra are included . . . all substantial components, not toys."

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A kid in California writes: "I am only twelve years old and I know that is too young to be able to go to work for you which is what I would like to do. But maybe we could work a deal where I would write some programs for you and you would give me a good deal on a 4K RAM Level-I TRS-80." And a Toronto, Canada, company "is pleased to announce MICROCHESS 1.5 for the TRS-80 micro-computer."

Let's face it: Radio Shack's introduction of a reliable, expandable computer system at $599 is a world-class breakthrough! It is enabling thousands of people, businesses and institutions to *personally* touch, *personally* program, and *personally* afford to get into computers for the first time. For about half the price of, say, a new Leica camera, can you afford NOT to think of TRS-80 as your next important acquisition or gift?

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it out on their machines. Sure enough, the bug wiped out the program.

When they tried "10 F.M= 1 TO 10", the program worked fine, even when the "bad input" 11 was entered. But with "10 F.M = 1 TO 2", the bug destroyed the program through line 1400. Apparently, the only way to a avoid the problem is to verify input values as reader Barrett suggests.

Here's another interesting Level I bug we've heard about. Type in this short program:

```
10 IN. "BBEENN
20 G. 10
```

Note the absence of close quotes on the input statement in line 10. Now RUN. The computer should list "BBEENN" for a few seconds, then stop with a list of "BEN"s printed in double-wide letters. (At this point, the keyboard is locked out, so you'll have to press the reset button to regain control of your computer.)

Clearly, the double-wide letters are available in ROM; but this is the only (very unsatisfactory) way we've found to access them in Level I. If any readers have found a way to print the double-wide letters at will, we'd love to hear about it.

Level I – as well as all other BASICs – contain a number of bugs similar to Barrett's that will crash programs under peculiar circumstances. Send your bugs – along with solutions, if you've found them – to *Personal Computing.* We'll print the most interesting ones. – *D.W. & G.D.*

Chess Notes

Dear Sir:

Your "Computer Chess" section is the primary attraction your magazine has for me. I have several suggestions that I think might enhance the value of that section.

First, when you publish the results of a computer chess tourney (e.g., Microcomputer Tourney in San Jose, May 1978 *Personal Computing*), publish the entire table of results so that we can see which programs defeated which programs, and which were playing white. Although (for example) I know that Boris presumably defeated two other programs, I don't know which those were.

Second, the "identity" of the various programs should be given in terms of their authors or the address to which one could write for additional information. "Commercial" programs (for sale) and dedicated chess "machines" (like Boris and Chess Challenger) should be identified as such, with the name and address of the vendor.

Third, I think that complete games are only moderately useful without an informed commentary. I suggest that in only rare instances would a game be interesting enough or important enough to be published by itself, sans commentary – and if it is that interesting and that important, it deserves a commentary. This might mean fewer game scores are published, but I think it would mean that those published would be more valuable.

Fourth, I think it would be a valuable feature if you would arrange a double round robin tournament (each player plays two games with each other player, once as white and once as black) of all the commercial machines. The results table should include complete information (e.g., what level Chess Challenger was played at, how much time per move Boris was set at, etc.).

Finally, a question: I gather that Chess Mate must be a commercial chess machine (from its memory configuration: 5K ROM, ¼K RAM). Where can I get information on it?

Michael W. Ham
Iowa City, IA

Editor's note: All tournament results we publish are from reports received from the tournament site itself. We include all the facts that are included in those reports. Unfortunately, many facts – such as those you list – are overlooked.

We are making progress in obtaining annotations to games. As you probably know, it is not an easy task for an annotater to replay a game, pause over and analyze every move, suggest better moves and constantly play out games to the end every time a promising variation occurs. This is a time-consuming effort and many chess players are, justifiably, reluctant to undertake complete annotations. However, we are slowly making friends with rated and dedicated chess players who have kindly agreed to annotate some of the games. They will be appearing in future reports.

Hopefully, we expect to include computer chess in future *Personal Computing* shows. If we do, we will probably also sponsor a tournament among computerized chess games along the lines you mention. Also, the first San Jose microcomputer tournament, held in March '78, may lead to a second such tournament.

For information on "Commodore Chessmate" write to Bill Seiler, 901 California Ave., Palo Alto, CA 94304. It was slated to make its debut in the latter months of 1978. Whether it is actually on the market now is a question that Bill might be able to answer for you. – *H.S.*

Bad News BASIC

Dear Editors:

At least one branch of Cultural Linguistics teaches that the deep differences in languages lead to differences in the way one looks upon the world (sometimes referred to as the Sapir-Whorf hypothesis; see, for example p. 77 of Quine's *Word and Object,* MIT Press, 1960).

I would be interested in hearing about experiences later in life of those who have first learned a simple programming language (BASIC, LOGO, PILOT, etc.). In the world of p-baked ideas ($0 <= p <= 1$) I have an idea that is about .48-baked (i.e., slightly less than half-baked) and that hypothesis is that few programmers who begin their programming life with a language so limited as BASIC ever significantly extend their ability to make full use of the data and program structuring capabilities of higher level languages learned later.

In any case, I solicit from programmers, managers of programmers and teachers of programming answers to the following questions:

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gramming language?

Is BASIC (or FORTRAN, COBOL, PL/I – you supply the name) a good or a bad first language? Why?

If the programmer's first language is "different" (e.g., SNOBOL, LISP, APL) from the common languages (e.g., ALGOL, FORTRAN, COBOL), what effect does this have on later programming ability?

If enough interesting or significant material appears, I hope to put together a report affirming or denying the hypothesis stated above. All contributions will be acknowledged and all persons replying will receive a copy of the conclusions.

R.L. Wexelblat
Sperry Univac
Br x 500, M.S. 2G3
Blue Bell, PA 19424

Editor's note: Readers wishing to respond to Mr. Wexelblat's request can write directly to him at the address provided. Send a copy of your letter to *Personal Computing* and we'll publish the most interesting ones. – *D.W.*

Computers for the Disabled

Dear Sir:

The Spain Rehabilitation Center at the University of Alabama Medical Center has a project underway to demonstrate both the utility and economic feasibility of the new generation of personal computers for use by the severely disabled. The programmability of the computer will allow it to serve as a general purpose appliance used as an aid in communication, education, environmental control and entertainment.

This system, as currently envisioned, will consist of a microcomputer, an online storage device for programs and data, two TV monitors for user feedback and information display, a printing device for typed output, a speech recognition device for vocal input of commands, data and text, a powerline controller for environmental control and a telephone dialing/answering device. We are attempting to select plug-compatible, economically priced components which are widely distributed and serviced.

Programs will be written or purchased to perform specific functions in each of the four general areas mentioned above. However, we would be very interested in receiving ideas from *PC* readers, particularly those who are disabled or who have disabled friends or relatives, and those who have personal computers and would like to develop hardware or software for the system on their own.

We look forward to receiving input from anyone who may be interested in this project.

Charles Healey
Spain Rehabilitation Center
U.A.B. University Station
Birmingham, AL 35294

Needlepoint Notes

Dear Editors:

I do not yet have a computer, but I have used an HP-67 to assist in the design of circular and eliptical shapes for needlepoint and cross stitch patterns, so I found Linda M. Schreiber's article "Dazzler Graphics" very interesting. I wonder if she has looked into the use of a "Bit Pad" or other digitizing device for helping convert linear drawings to the square array format used on the TV screen and in needlework patterns?

Valerie Vann
Davis, CA

Author's note: The "Bit Pad" or any peripheral capable of generating x and y coordinates can be used to produce designs on the TV screen. I did consider the "Bit Pad" when I saw it demonstrated at a recent computer fair and learned that it would be compatible with my system. To use it with the Dazzler, the input data would have to be converted into color codes and address locations. This could be accomplished quite easily with a small software routine. –*Linda M. Schreiber*

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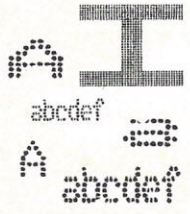

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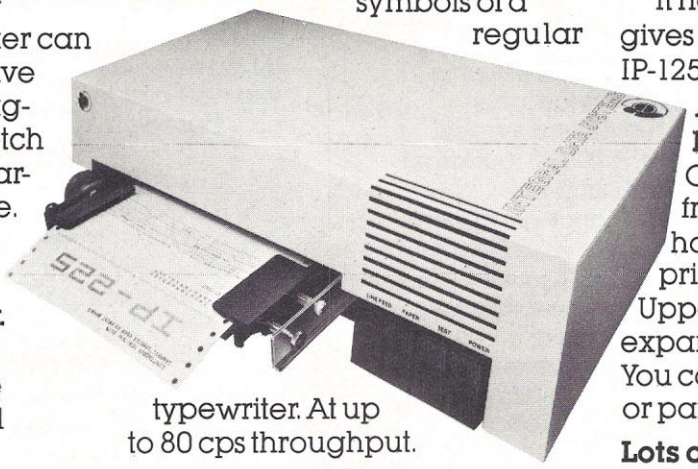
The BrighterWriter can print plain and simple. With 7x7 dot matrix clarity. You get all the letters, numbers, and standard symbols of a regular typewriter. At up to 80 cps throughput.



Ordinary paper.

Fancy or plain, the BrighterWriter prints on ordinary paper. Better yet, it prints on many shapes of paper. Single sheets. Roll. Fanfold.

Want more copies? The BrighterWriter prints multiple copies without extra adjustments.

Four easy buttons.

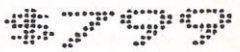
Operating the BrighterWriter couldn't be simpler. Up-front controls are easy to get to. A power button to turn it on. A test button to self-test your printer. A paper feed button to advance the sheets or forms. A line feed button to advance the paper a line at a time.

Prints any-which-way.

The BrighterWriter comes in two models. The IP-225, at $949, gives you a BrighterWriter with tractor-feed drive for precision forms control. This one can handle everything from labels to 8½" paper widths.

It has eight form lengths and gives you all the features of our IP-125.

A brighter buy.



Our IP-125, friction-feed, BrighterWriter has a 96 character set and prints on 8½" wide paper. Upper and lowercase. It prints expanded characters, too. You can choose a RS-232 serial or parallel interface. $799

Lots of goodies.

There's more. Choose all kinds of options for your BrighterWriter. Up to 132 characters per line, variable character densities, larger buffers, special graphics packages, interface cables, and more.

Give us a call or write. Integral Data Systems, 14 Tech Circle, Natick, MA 01760, (617) 237-7610.

Better yet, see the BrighterWriter at the store nearest you.

Integral Data Systems, Inc.

*Some of these advantages require extra-cost options.

CIRCLE 9

FIVE SPECIAL
SOUTH CAROLI

1. A COMING ATTRACTION (Maybe) . . .

South Carolina's Byte Shop has been around longer than 90% of the small computer businesses in the country.

One reason is we try to stay on top of the technology. So when IBM introduced their new truly "electronic typewriters" a few months ago (Models ET50 and 60) we ordered them and began experimenting. In terms of reliability and ease of operation, we found the new machines to be light years ahead of the "mechanical" selectric (especially the ET50 with proportional spacing).

And now, thanks to a dedicated staff member (Fred Collins) we have developed a working prototype interface with IBM's fantastic new typewriter. And we're ready to move from prototype to production.

As this ad goes to press, we're waiting for IBM's approval of our interface, (for purposes of warranty and maintenance) which should pose no problem since the typewriter is totally isolated from the computer and the interface card (ETO - Electric Typewriter Output). Also, we have limited the printing speed to IBM's normal speed for automatic typing. Price-wise, just for a rough budgeting idea, the combined cost of our interface card and the new IBM machine should be around $2,000.00 (our target price for the card alone is $295.00, and we understand attractive three year financing terms with a modest down payment and about $50.00 per month, are available from IBM on the typewriter).

At present, we are able to make the following limited offer: if you're interested, send us a conditional order (no money now) to get your name on top of the list. When our production models are ready (hopefully in December), we'll get back to you with precise info and if you're still interested, we'll fill the orders in the order we receive them now.

2. SUPER PAYROLL ON NORTH STAR DISK (CROMEMCO AND APPLE VERSIONS SOON)

We strongly feel this is the best payroll program available. Written by Dr. Tec Chand, it calculates, prints all forms, writes paychecks, cost accounts, tip accounts for restaurants, allows for overtime on a weekly or daily basis and more. Truly fantastic.

Interested? Write us and we'll send you a complete manual free. Then, if you're still interested, sign the form that will come with the manual, return it with a $20.00 check, and we'll send you a demo disk containing all programs (except the master payroll). Finally, forward us the balance of $180.00, or order COD, and we'll send you the total system.

Now comes the real beauty of our offer: for whatever reason, return everything within 30 days and you get a complete refund. What more could you ask?

3. PRE-CHRISTMAS SPECIALS...

(At least one of each item below - Special priced for shipment prior to December 31, 1978. Our inventory tax is based on January 1 inventory)

Sol 20 Factory Assembled ~~$2,095~~, $1,895
SOL 20 Kits ~~$1,550~~, $1,350 SOL 20 16 KRA ~~$329~~, $299
Poly 88 System 16 ~~$2,250~~, $1,495 Poly 8813 ~~$3,250~~, $2,995 (new) $2,595 (demo)
Poly 8813 upgrade ~~$1,450~~, $1,250
Xitan Alpha 1.5 $795, Xitan Z80 CPU assembled ~~$199~~, $159
Xitan System Monitor Board II ~~$395~~, $299
IMSAI EXPZZ Kit ~~$750~~, $499
Cromemco TV Dazzler Kits ~~$215~~, $175
Micropolis 1053 Mod II ~~$1,895~~, $1,695
Vector Lt Chassis ~~$429~~, $329
Byte 8 Chassis Kit ~~$229~~, $159
Byte 8 CPU Kit ~~$120~~, $89
Altair 680 B Kit $249
Smoke Signal Broadcasting Disk Controller Board $199 - P38I $99
Prom Burner $99
RS6 Math Function Card ~~$129~~, $69
CRC Keyboard Kit ~~$50~~, $39
Morrow (Thinkertoy) Speakeasy Cassette Kit ~~$120~~, $95
Poly VTI-64 Video Card ~~$295~~, $195
Xitan Package A on CPM Disk ~~$249~~, $149
VISTA 5 ¼Single Disk with CPM ~~$870~~, $599
VISTA 250, Dual 8" Disks with CPM ~~$2,595~~ $1,795

OFFERS FROM NA'S BYTE SHOP*

TRADE INS:

TRS 80 Screen Printer $495
Perhipheral Vision Floppy Controller, Innovex Drive, Power Supply $499
GSI 8" Floppy Disk Drive $299
Friden Flexowriter SPD $249
Friden Flexowriter (newer model) $449
ASR 33 Teletype $599

4. CAREER OPPORTUNITIES . . . Byte Shop #32 needs:

1. **A Retail Store Manager -** Computer product knowledge and sales experience essential. We want a "take-charge" innovator capable of managing a new store with a quarter million dollar inventory. Serving in-store customers as well as a substantial mail order business. Earning potential unlimited.

2. **Super-Tech -** Have you worked with micros for at least a couple of years? Problem-solved a S-100 Buss? Are you comfortable writing routines to patch I/O? Do you think you could join a Service Department equipped with a Tektronix TM515/Digital VOM/32 bit logic analyzer/ Frequency Counter, A Tektronix Dual trace storage scope, 465 DM 44, 100MHZ Dual Trace Scope, Ultrasonic Cleaner, and Environmental Chamber for Burn in and Testing? If you understand all this (and are interested in earning a base of $15,000 to $18,000 per year plus commission on service contracts) you may be our person.

2. **Super Soft -** We're looking for an experienced programmer with heavy emphasis on business programs to join our software team. Basic or Fortran essential (medical and general ledger applications would be a real plus).
All interested parties phone 1(803) 254-0804, or send resumes to:

Nexsen B. Johnson
Byte Shop #32
1920 Blossom Street
Columbia, SC 29205

***WE'RE THE ONES THAT PUT OUR SHOW ON THE ROAD**

5. CHRISTMAS SPECIAL

APPLE II 16K, Color TV/monitor and Cassette Recorder

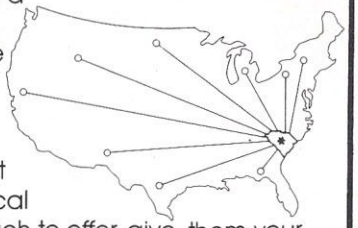
only **$1395.00**

COLOR TV/MONITOR: $299.00 introductory offer
This is a GE 10" Solid State TV with direct video input. The input is transformer-isolated from your computer and features high bandwidth. If you already have the TV, the Colormon Refrofit Kit is available separately (no holes to cut—no solder connections) at $49.90.
This is not a **MODULATOR.** It is a true "transformer coupled" direct composite video input and therefore not subject to the FCC BAN. It will only fit the new Model 10AA9402 GE PORTACOLOR TV.

QUESTION

Q. I live hundreds of miles from Columbia, South Carolina—shouldn't I try to buy from a local dealer?

A. Yes—by all means—you should . . . IF your local dealer has the experience, expertise, and inventory. Our Byte Shop (#32/Columbia, South Carolina) has been in business longer than 90% of all the small computer stores in the country. We have over ¼ million dollars in inventory, our employees are bonded, and we have a wealth of experience in product lines, service repair and general **support after the sale.**



In the unlikely event that you have a local dealer with that much to offer, give them your business. If not, give us a call. Chances are we can support you better from South Carolina.

CALL 1-(803)-771-7824 TO ORDER OR WRITE

BYTE SHOP #32

1920 Blossom St. Columbia, S.C. 29205

BankAmericard (Visa) or MasterCharge welcome

Holiday Gift Buying Guide

BY GARY W. DOZIER

As the holiday gift-giving season rushes headlong into our lives again, we develop disheartening despair over what to buy our friends and loved ones suffering computer "consumption". Getting the right gifts for everyone is a heavy burden, made no easier when the recipient is an avid computer hobbyist or electronics enthusiast. We hope this guide helps you.

Unfortunately, few of us can afford to give full computer systems or elaborate peripherals. Technology has advanced so rapidly, however, that now even some delightfully inexpensive games, toys and novelties are microprocessor or microcomputer controlled. Let's look at some of these devices along with several other exciting and practical gifts for computerists.

Nearly all the suggestions below can be found in major department stores and discount centers or at local computer retail shops. Other items can be ordered through computer mail-order enterprises.

One trend this year is toward a Star Wars/Battlestar: Galactica theme in many gift suggestions for both young and old.

Milton Bradley offers four gift suggestions to cover just about all bases. Electronic Battleship is the computerized version of a great naval strategy board game. Simon is Milton Bradley's tantalizing and certainly addictive electronic game to test hand-eye-ear-memory coordination. Comp IV challenges the player to deduce logically a secret number selected by the instrument's circuitry. MB's final entry is Star-Bird, a futuristic spacecraft toy that will delight the young-at-heart space cadet with its sound-and-light effects controlled electronically.

Parker Brothers, always brewing up something creative and stimulating from the historic, mystical town of witches, has three enchanting gift suggestions that will drive you bonkers.

Merlin, looking somewhat like a space-age telephone, is so sophisticated that it has a voice, a language and an intelligence of its own. Six games are contained within its memory: Tic Tac Toe, Blackjack 13, Mindbender, Echo and Magic Square; Music Machine, the sixth program, lets you compose music – up to 48 notes and pauses – then plays it back to you.

P.E.G.S. is Parker Electronic Game System – a sound-generating, double-sided electronic board that lets you play many exciting tactical games like Space War, Tank Skirmish and Snake Bite.

Code Name: Sector, third in the Parker Brothers line-up, is a computer game of submarine pursuit. The players plot courses on a nautical chart, navigate within a given range, and fire torpedos. Sound effects and visual signals add to the excitement.

Mattel Electronics offers several gift ideas: Auto Race, Mind Boggler, Battlestar Galactica/Space Alert, Electronic Football, Las Vegas Pinball and Electronic Basketball. Only the pinball machine stands on the floor; the others are the size of hand-held calculators. Each game offers novel sound effects and an amazing array of functions. For example, the football game features scoring, yards to go, first

down distance, which down and running time. When you get a field goal or touchdown, the device plays the "Charge" song! The other hand-held electronic games form Mattel play different tunes or sound effects when you win or score. You have to hear and see these little electronic packages of fun to truly appreciate them.

Coleco has a wide variety of devices that will tempt kids of all ages. Their most popular game of the season, another hand-held device, is called Amaze-A-Tron. It consists of a 6 x 6 grid. You can choose any of eight different games. All the games involve following a maze from one location on the board to another. Four games can be played solitaire, and four can be played with two players. The ingenious circuitry instructs you where to begin and where to end the game on the matrix; you must decide which path to follow to reach your designated goal. Every time you place your marker on the correct square in proper sequence, a little melody plays. There are two melodies – one for each player, red and green. One of two corresponding LEDs lights up to signal who's turn is next. With all the flashing lights, the LED display, the player's little tunes and the audible timer clicking away the 15-second time period for each move, the real surprise is what happens when you reach your goal and Amaze-A-Tron plays that familiar melody so often heard just before the horses start a race.

Needless to say, the market is filled with countless electronic toys and novelties that will fascinate young'ns and ol' folk for hours on end. We've

looked at only a few of the more popular companies and their respective products.

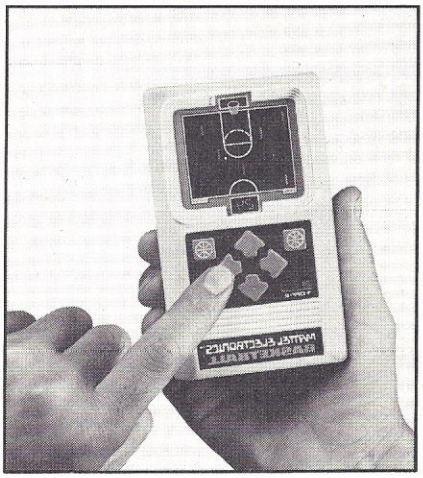
Delving into some of the more sophisticated (and, correspondingly more expensive) electronic devices, we see a home computer that began as a non-programmable unit, but after more thorough studies of the needs an and desires of the consumer, was broadened in its capability to provide for programming by the user. This home computer, the Umtech Video Brain, has much going for it at a very reasonable price (about $500 to $1000).

To begin with, the Video Brain is well-designed for computer greenhorns. It's simply a black box the size of a portable typewriter, containing several jacks for video output, two joystick controls, cassette record and playback, printer output and AC power/transformer plug. Depending on the upgrading you want, other input/output features are available. The display is in color, but will clearly show up on a black and white TV.

Essentially, all you need to do is link the antenna switch (like those used with the home games of recent vintage) to your TV and to your Video Brain. An existing "operating system" allows basic information to be displayed on the screen. But sophistication is just a cartridge away. You slide the cartridge into the slot on the top of the machine and your designated program is ready.

I've dabbled with several of the programs, and found that, although some are rather low-level, this little computer works like a breeze. You don't have to do much to execute some relatively high-level programs.

Programs for the Video Brain come in these categories: Money Management, Communications, Education and Entertainment. About 22 cartridges comprise the program library. The four programs in the Money Management series are certainly practical, simple to use and beneficial in keeping your records straight. Music Teacher is kind of fun: we can graphically see the notes to two old standbys played on the music staff and indicated alphabetically below the staff. Note value is shown by a dotted line that expands and contracts according to the note being played. The tones are output via the TV speaker. Lemonade Stand, a business simulation program with interesting sounds and graphics, teaches the essentials of economics and business management. The company also



offers fun-and-games cartridges.

If you don't yet own a personal computer or have a friend who doesn't – you should give the Video Brain a close look. It's a pleasing and inexpensive system to ease you into the exciting world of computers.

You may be a true philanthropist, have a healthy bank book, hold a golden credit rating or own Fort Knox. If any of the above are true, you can consider heftier gifts for your loved ones. There are scores and scores of computer systems, peripherals, PC

boards, test equipment and miscellaneous complements (the accoutrements to your computer system).

A visit to your local computer dealer will expose you to a wide array of gift possibilities – including some dynamite stocking stuffers. OK Machine and Tool offers all kinds of items for wire-wrapping needs; Continental Specialties presents a significant list of breadboarding supplies, logic probes and monitoring equipment.

If business systems are on your list, you should give serious consideration to the Versatile 3B from Computer Data Systems and the Billings System, for sure. Technical and developmental systems you should consider include the Technico system, RCA's COSMAC VIP, and the Netronics ELF II.

Computalker offers extensive software to execute with its PC board (which generates synthesized speech). DC Hayes makes a modem for S100 computers that allows data communications between your system and a central computer. Your computer will be the talk of the town (and could no doubt inform everyone) once you've added these PC boards.

SD Sales, Vandenberg Data and CreaComp Systems all make high quality, high density RAM memory boards for S100 computers. Consider the specifications of your gift recipient's specific computer and peripherals before jumping into a big purchase such as these 64K, 16K and 32K memory boards. They are three of the best-designed memory boards you will see anywhere.

Book publishers such as Sybex, Hayden, diLithium Press and Northern Technology Books list tomes on every imaginable subject in the computer field. Scores of companies have mushroomed overnight to provide software for the TRS-80, the PET, the Apple II and several other microcomputer systems. You might consider good books as handy and practical gifts, your friends will treasure for a long time.

If you want a photographic remembrance in gift form, scoot down to one of those computer portrait shops, get photographed and have your image cooked onto a T-shirt, sweatshirt, canvas bag, banner, dartboard or almost anything else.

Of course, you can always give subscriptions to *Personal Computing* magazine. Software listings, interesting commentary and extensive new product listings make each issue of *PC* a valuable reference tool for years to come.

Yes, buying gifts for that special breed of people called computerists can be a pain – and be relatively expensive. This season of the year, however, reminds us that there is abounding joy in giving from the power supply . . . ah, heart. Happy Holidays!

For more new products and gift ideas, see "What's Coming Up", beginning on page 72. □

Company Addresses

Milton Bradley Company
Springfield, MA 01101

Parker Brothers
50 Dunham Road
Beverly, MA 01915

Mattel Inc.
5150 Rosecrans Avenue
Hawthorne, CA 90250

Coleco Industries, Inc.
945 Asylum Avenue
Hartford, CT 06105

Umtech/Video Brain
2950 Patrick Henry Drive
Santa Clara, CA 95050

OK Machine & Tool
3455 Conner Street
Bronx, NY 10475

Continental Specialties
70 Fulton Place
New Haven, CT 06509

Computer Data Systems
5460 Fairmont Drive
Wilmington, DE 19808

Billings Computer Corp.
2000 E. Billings Avenue
Provo, UT 84601

Computalker
1730 21st Street, AH
Santa Monica, CA 90404

DC Hayes Associates, Inc.
16 Perimeter Park Dr.,
Suite 101
P.O. Box 9884
Atlanta, GA 30319

SD Sales
P.O. Box 28810
Dallas, TX 75228

Vandenberg Data Products
P.O. Box 2507
Santa Maria, CA 93454

CreaComp Systems
4175 Veterans Highway
Ronkomkoma, NY 11779

LOOKING FOR THE NEW KENTUCKY FRIED CHICKEN OR McDONALD'S? JUST OPEN YOUR EYES!

Back in the fifties, if someone had suggested you invest in a hamburger stand called McDonald's or a chicken store run by Colonel Sanders, you probably would have laughed. Most of us did. The few who didn't, and invested in KFC or Big Mac are millionaires today. They enjoy "finger lickin' good" profits and "have it all done" for them.

The whole trick to investing in your own business is to **keep your eyes open for something like a KFC or McDonald's**. A business that (1) requires a **small investment** that can be recouped quickly, (2) has an **enormous profit margin**, and (3) has great growing **consumer acceptance.**

There is such a business.

The business is computer portaits, and it's one of the hottest, most profitable new ideas around. International Entrepeneur's Magazine stated that there are locations that are currently grossing **from $2,000 to $4,000 a week**. Imagine, grossing up to $4,000 a week from a small investment.

that gives you **your own high volume, all cash business.** No franchise fees or royalty payments, **all the money is yours**.

Computer Amusement Systems, Inc., (CASI) of 11 West 20th Street in New York City, has taken today's hot trends—T.V., computers, and instant pictures and combined them to produce a computer portrait system that is high in quality, low in price, portable and **requires absolutely no photo or technical experience.**

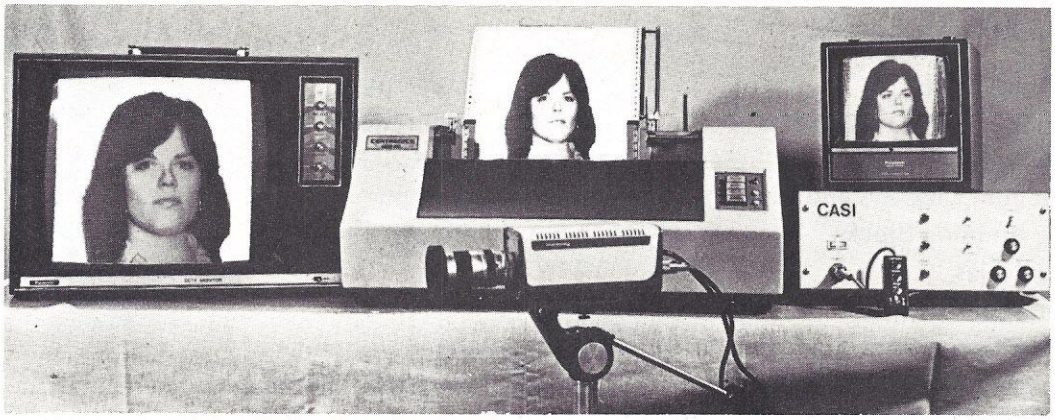
Easy to operate and easy to move, **the portable CASI system can be set up anywhere:** malls; flea markets; shopping centers; conventions; rock concerts, anywhere with high pedestrian traffic and just a little floor space. This **instant traffic stopper** will make a computer portrait in just fifty-five seconds! The picture is first seen on a T.V. screen, then dramatically printed before your eyes.

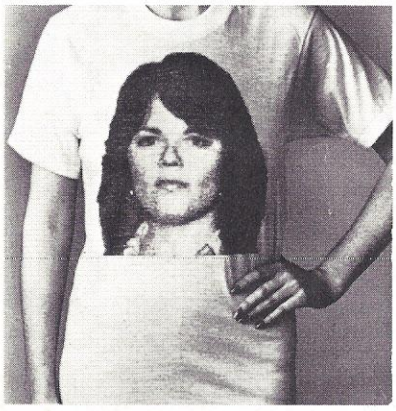
And there's more. You can transfer the portraits instantly to **many high mark-up, big profit items**—tote bags, T-shirts, calendars, puzzles, dart games—whatever the latest trend might be. CASI supplies the wholesale sources for everything you need to be in on the profits.

And there's more. Like special options that allow personalized messages to be printed right on the computer portrait. Or programs that will print out personal bio-rhythm charts in seconds. **All big moneymakers**.

So open your eyes to the most dynamic, profit making opportunity of the year. **Perfect for part time, full time, family operation or absentee management**, CASI is your ticket to success. Start putting money in your pocket today with CASI computer portrait systems. Don't send money just write for details. We'll send them right away.

Before you make an important decision in this exciting new business, know who you're buying from. We suggest you ask your banker about us.





YES! I WANT TO BE THE FIRST IN TOWN TO CASH IN ON COMPUTER PORTRAITS. PLEASE RUSH DETAILS

Name _____
Address _____
City _____ **State** _____ **Zip** _____
Home Phone _____ **Business Phone** _____

CASI
COMPUTER AMUSEMENT SYSTEMS INC.
11 West 20 Street New York, N.Y. 10011, Dept. 10
(212) 929-8355

P

CIRCLE 11

Computer Enterprises' Doubleheader

Take A Look At Our Latest Line Of Products From MICROPOLIS™

Quality Merchandise
Lowest Prices
NEW! No-Risk Guarantee

ALL ASSEMBLED:	Credit Card Price	Cash Discount Price
METAFLOPPY DISK SUBSYSTEMS FOR THE S-100 BUS.		
1053 Mod II Two-disk system with 630,000 bytes (formatted)	1,774	**1,706**
1043 Mod II One-disk system with 315,000 bytes (formatted)	1,072	**1,031**
METAFLOPPY ADD-ON STORAGE MODULES		
1023 Mod II One-disk 315,000 byte add-on storage module with enclosure and power supply. Requires daisy chain cable.	604	**581**
MACROFLOPPY DISK SUBSYSTEMS FOR THE S-100 BUS.		
1042 Mod I One-disk system with 143,000 bytes (formatted)	744	**716**
MACROFLOPPY ADD-ON STORAGE MODULES		
1022 Mod I One-disk 143,000 byte add-on storage module with enclosure and power supply. Requires daisy chain cable.	510	**491**
DISKETTES		
1081-05 Package of 5 Micropolis diskettes (5-¼") for use with both Mod I and Mod II drives.	33	**32**
DAISY CHAIN CABLES AND ACCESSORIES		
1083-02 Daisy chain interface cable B, with 3 connectors for use with 2 storage modules attached to controller.	33	**32**
1083-04 Daisy chain interface cable D, with 5 connectors for use with 4 storage modules attached to controller.	61	**59**

NO RISK GUARANTEE

Buy from Computer Enterprises with complete confidence. Our guarantee to you is:

- If after placing your order, we do not deliver within 90 days (most shipments are from stock to 30 days), - you may cancel your order for a full refund.
- If after receiving product, it is not what you expected, you may return it (please call first for return authorization within 10 days) for a full refund.
- If you are unsatisfied with product for **any** reason, you may return it for a full refund, provided:

1. It is in original purchased condition.
2. It is within manufacturer's warranty period.
3. Warranty card has not been altered in any way.
4. All documentation is in original condition.
5. You have called us for return authorization.

- We will honor and fully support manufacaturer's warranties.

(All judgement of terms and conditions for suitability of returned merchandise shall be subject to the sole discretion of Computer Enterprises)

(All return shipments must have shipping charges prepaid.)

IMSAI® The VDP-40 Video Data Processor

Credit Card Price: $4207.00

Cash Discount Price: $4046.00

Designed for the office or for the home, the IMSAI Video Data Processor, the VDP-40, places a microcomputer well within the budget of the average small businessman or systems developer. The VDP-40 may be used to computerize the accounting and inventory functions of a small business. The VDP-40 can communicate to additional VDP-40s or other 8080/85-based computers, and can act as a terminal in a data communications network.

The VDP-40 is a fully integrated system, featuring an 8085 microprocessor, 32K RAM memory, two 5¼-inch floppy disks, 9-inch CRT, heavy-duty power supply, professional keyboard, terminated/regulated motherboard, and serial and parallel I/O ports in a handsome cabinet.

The IMSAI VDP-40 comes fully assembled and tested. Built-in serial and parallel I/O ports provide the means to connect, via appropriate cabling, peripheral devices including line printers, modems and auxiliary terminals. Built-in expansion capability allows the user to increase the RAM, I/O ports and number of disk drives.

SYSTEMS FEATURES.

- Fully Integrated Computing System in a single Cabinet
- High Speed 8085 Processor
- 80 x 24 Video Display
- 5¼-inch Twin Floppy Disk Drives
- Integrated CRT Display
- Microprocessor-Driven Keyboard With N-Key Rollover
- Terminated/Regulated Motherboard
- Heavy-Duty Power Supply
- Printer/Modem Port Included
- 32K RAM Memory Included
- 2K ROM Monitor Included
- Disk Expansion Capability in Excess of 4.5 Megabytes of On-Line Storage

System Expansion? Extra slots in our S-100 bus motherboard and our new power supply allow almost unlimited expansion.

Need more disk expansion? A controller option of the VDP-40 allows expansion to greater than 4.5 M Bytes.

Add a line printer, an IBM compatible tape drive, a modem: all are available, with the interfaces and software to make it work for you.

Shipping charges: $10 per CPU on larger units; $1.50 per kit. $2.00 min. per order.
Delivery is stock to 30 days on most items. Shipment is immediate for payment by cashier's check, money order or charge card. Allow 3 weeks for personal checks to clear. N.Y. State residents add approp. sales tax. Availability, prices and specs may change without notice.

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computer enterprises™

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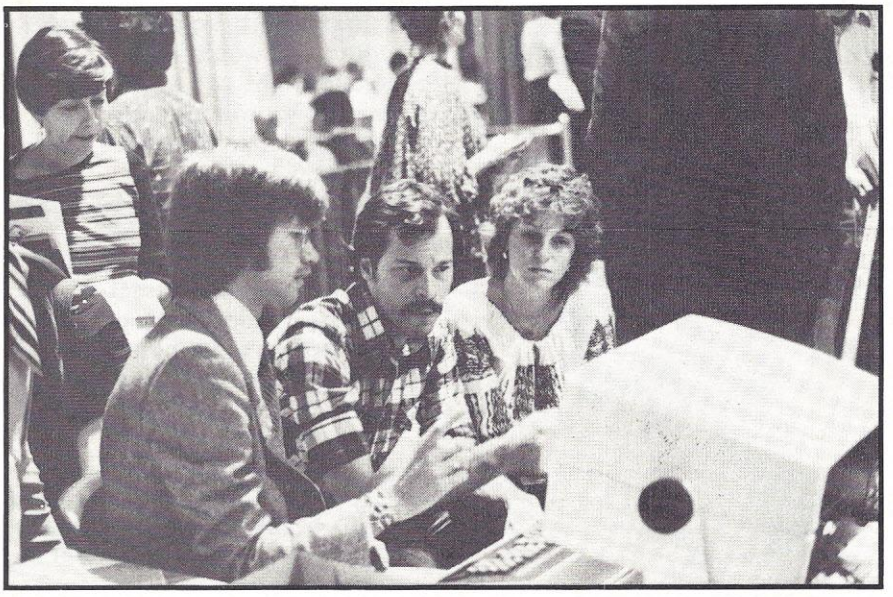
P.O. Box 71
Fayetteville, N.Y. 13066
Phone **(315) 637-6208** Today!

CIRCLE 13

RANDOM ACCESS

New York Show Draws Over 13,000



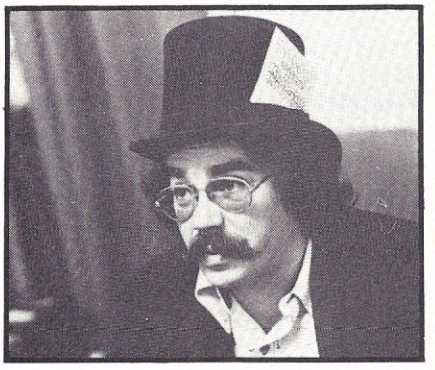
Radio Shack's booth attracted crowds of young and old.

New York's Personal and Small Business Computer Show in September drew over 13,000 attendees visiting nearly 100 company exhibits in 17,000 square feet of New York's Coliseum. Said show manager Ralph Ianuzzi Sr., "We feel our show was the most heavily attended show in the country in this field."

While hobbyists and home computerists attended in abundance, Ianuzzi estimated that 40 to 50 per cent of the crowd at the three-day event were businessmen, and another 20 to 30 per cent were professionals such as doctors, lawyers and dentists. These attendance estimates reflect experts' views that the immediate market for small computers is small businessmen and professionals, with the true home computer still a few years away.

Nonetheless, said Ianuzzi, more than half the companies at the show exhibited products for both personal and business users. Systems on exhibit at the show ranged from Commodore's PET and Radio Shack's TRS-80, each selling for less than one kilobuck, to IBM's System 5100, which sells for about $15K in minimum configuration.

Software suppliers ranged from the Mad Hatter, who sells games and personal programs for as low as $6 per cassette, to Synchro Sound Enterprises, with elaborate, $500 business packages.



Tim Quinlan, the Mad Hatter

Business software represents another large segment of the small computer market; without a program in its innards, a computer is just a very expensive conversation piece. Maury Goldberg of Mini-Micro Mart noted that the software people want — written for specific business and professions — is not yet generally available. Steve Birnbaum of Synchro Sound Enterprises said his company started selling hardware, then moved into software as well because their customers demanded it. Even the Mad Hatter — not as crazy as his name implies — plans to market small business software in the near future.

Businessmen, professionals and hobbyists attended the New York show in abundance.

Copyright Update

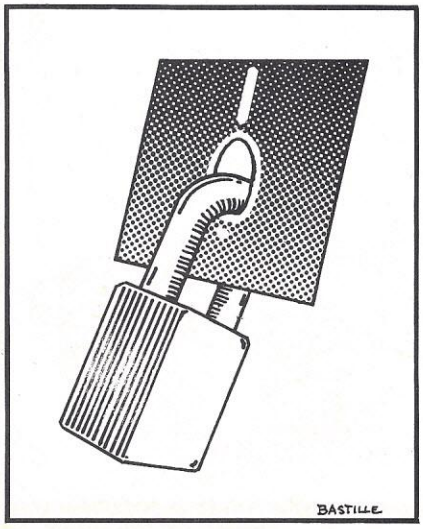
After three years of collecting data, holding hearings and deliberations, CONTU, the National Commission on New Technological Uses of Copyrighted Works, recently submitted its final report to the President and the Congress.

The report recommended changes in copyright law to assure public access to computer programs and to respect the rights of software originators. While proscribing the unauthorized copying of computer programs, CONTU also sought in its recommendations not to inhibit the rightful use of these works and not to block their development and dissemination. The report also interpreted the present copyright law as protecting computer data bases.

To balance the rights of proprietors and users, CONTU suggested the enactment of a new Section 117 of the Copyright Law. CONTU foresaw problems with the original section, which gave all duplication and translation rights to the author. Lack of standardization among programming languages and hardware in the computer industry make adapting software to the possessor's computer a prerequisite to its use. CONTU's recommended Section 117 amends the standard provision of copyright law granting the exclusive right to prepare translation, transformation and adaptations to copyright proprietors.

CONTU also recognized the need of computerists to make archival copies of programs to guard against destruction or damage by mechanical or electrical failure, also proscribed by Section 117. The commission felt that "one who rightfully possesses a copy of a program should be provided with a legal right to copy it to that extent which will permit its use by that possessor." However, copyright law treats archival copies differently from the original. Their maker neither owns their copyright, nor has he bought their rights from the creator — only that of the original. The new Section 117 would neither permit the sale of archival copies, nor allow ownership of them should possession of the original computer program "cease to be rightful".

Feeling that "computer programs are the product of great intellectual effort and their utility



is unquestionable," the Commission felt some form of protection necessary to encourage the creation and broad distribution of computer programs in a competitive market and concluded that "the continued availability of copyright protection for computer programs is desirable. This availability is in keeping with nearly two centuries of development of American copyright doctrine during which the universe of works protected by statutory copyright has expanded along with the imagination, communication media and technical capabilities of society."

However, author John Hersey, President of the Authors League of America and CONTU member, disagreed that copyright was either appropriate or necessary to protect the usable forms of computer programs. According to Hersey, "In the early stages of its development, the basic ideas and methods contained in a computer program are set down in written forms, and will presumably be copyrightable with no change in the 1976 Act. But the program itself, in its mature and usable form, is a machine control element, a mechanical device, which on Constitutional grounds and for reasons of social policy ought not to be copyrighted."

What Hersey objects to is the fact that admitting these devices to copyright would make the first time copyright had ever covered a means of communication, not with the human mind, but with machines.

Pointing to the lack of evidence of software "rip-off", Hersey suggests that "the existing network of technological, contractual, nondisclosure, trade-secret, common-law misappropriation, and (in a few instances) patent forms of protection, possibly to be joined soon by Senator Abraham Ribicoff's Computer System Protection Act — to say nothing of laws on fraud, larceny, breaking and entering, and so on — will be wholly adequate, as they apparently have been up to now, to the needs of developers."

Ironically, had it not been for the "bootlegged" recordings of artists such as Bob Dylan and the Rolling Stones which appeared in the early 70's, the issue of whether computer programs would be eligible for copyright protection would be moot. Until 1971 in accordance with a 1908 Supreme Court decision, forms of communication "not readily perceptible to human eyes" were denied copyright protection. Although the decision could have made it "open season" in the duplication of piano rolls, shellac and vinyl records and audio tape recordings, the cost of disk duplication made commercial piracy too expensive to undertake. However, the development of inexpensive transistorized tape recording equipment and its use by organized pirates produced a rash of bootlegged recordings, and the industry took action — action resulting in the Sound Recording Act of 1971. By nullifying the 1908 decision, the Act made those "not readily perceptible" forms of communication equal to those routinely protected.

A look into the future

Personal computers may have a greater effect on our current way of life than television had on life 25 years ago, believes Jack Nilles of the University of Southern California. Nilles and a team of four USC professors are studying the effects of the personal computer revolution, supported by a grant from the National Science Foundation.

The group plans to answer such questions as: will personal computers raise or lower educational standards? increase or decrease employment? expand the information society or create a new class of underprivileged — the information poor? influence energy consumption? cause economic chaos? protect or invade personal privacy?

"The answer to each of these alternatives is probably yes for someone at sometime," said Nilles "But the changes brought about as a result of the personal computer boom will affect different sectors of the economy at different times.

"Our objective is to forecast future developments in sufficient detail to allow public policy makers to anticipate potential impacts in time to react appropriately to them."

The team will focus on two aspects of the uses of personal computers: probable impact areas and public policy alternatives to those impacts. They plan to outline the probable impact areas, concentrating on the kinds of uses and users of personal computers. Through interviews and questionnaires, the researchers hope to find out who is doing what and who is affected. Second, they will perform a detailed analysis of the different impacts and of public policy alternatives to those impacts.

The study came about in response to the rapid increase in use of the personal computer. Before 1975 small computers were not sold commercially. Since the first sale three years ago, about 100,000 units have been sold.

"We do not claim to be able to predict the future; rather, we will provide information so policy makers can anticipate many of the problems that happen to arise," said Nilles.

Micro Sub

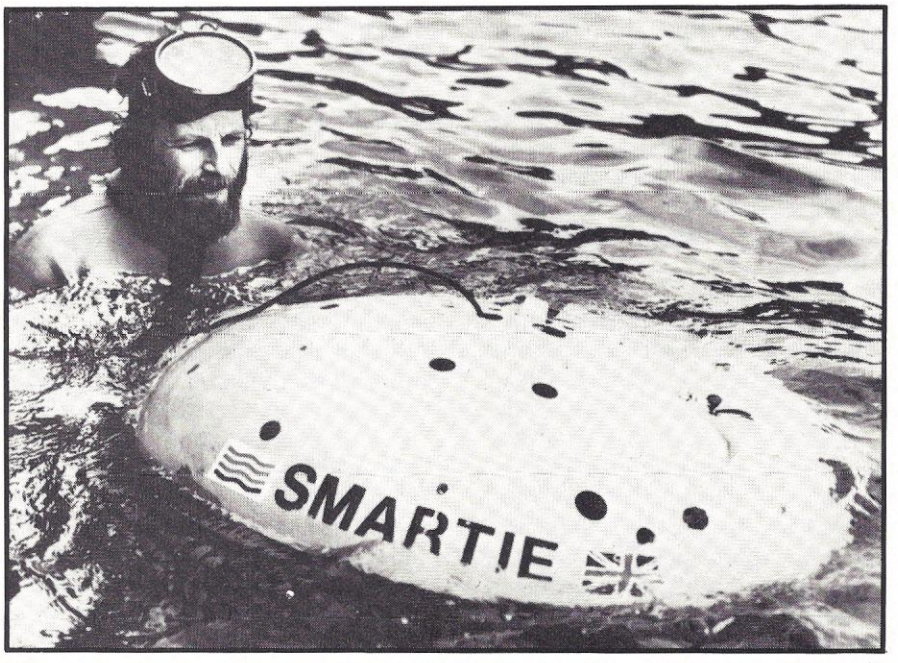
A microcomputer has been installed onboard an unmanned submarine designed for underwater inspection. The computer interprets manually input control signals from the console and controls speed and direction. It also accepts input from a magnetic compass and gyro to project an artificial navigation target the operator can follow on his video screen even in zero visibility. The computer compensates for abnormal currents, keeping the vehicle in position by operation of a hold button.

The British vehicle, known as SMARTIE (submarine automatic remote television inspection equipment), is linked to the surface by a 2200 pound breaking strain cable which also carries signals for power and control from the surface as well as picture signals from two or more TV cameras.

SMARTIE is driven by an electrically-powered water pump. It weighs 348 lbs., has a diameter of 3'7" and operates down to 1000'.

The submarine is available for hire as an emergency air-transportable kit or for long-term contracts.

Inquiries may be sent to Marine Unit Technology Ltd., Cy Corder, Chairman, 3 Friars Lane, Richmond, Surrey TW9 INL England, or to British Information Services, 845 Third Ave., New York, NY 10022, (212) 752-8400.



Notes from Users Groups

The Cleveland Digital group has been formed in Ohio. Members meet the third Sunday of every month at 2 pm at 8700 Harvard Ave., Cleveland, OH 44105. Contact secretary Louisa Jartz for more information.

Two users groups have been started in San Antonio, TX. The Z Users Group, for Zilog Z8, Z80 and Z8000 and the Mostek 3880 has a $5 fee for membership from June 1 through May 31. Planned projects include a news-

letter; directory of manufacturers, OEMs, systems houses, software houses; catalog of software and contributions available for sale to members, with 20% royalties to contributors; meetings during a few of the major conventions or trade shows; and data services.

The Xitan Users Group also has a $5 membership fee and similar project goals. For more information on either group, contact Jon D. Roland at 1015 Navarro, San Antonio, TX 78205,

Compucolor-Intecolor users group of Van Nuys, CA recently announced that it will start making programs available to members without the donation of a program.

Club members may now order programs from the club's library of over 300 programs for about $2 each, plus a disk and handling charge of $20 for the first disk and $15 for each subsequent disk ordered at the same time. Those donating an acceptable program will receive 5 or 6 programs back at no charge. These changes were made to encourage more members to become active.

Membership is $25, or $10 with the submission of an acceptable article for publication in the group's bulletin or a program to the library.

The club's library includes Editors, Assemblers, Startreks, Hells Dungeon, Piranha, Star Wars, Deflector, printer routines, Life, Turtle, Eliza, Payrolls, Inventory, Kalidescopes and display programs.

To join, contact Compucolor-Intecolor Users Group, 5250 Van Nuys Boulevard, Van Nuys, CA 91401.

The Ultimate Home Computer

Within the next four years predicts a recent report, current trends in the home computer and video tape recorder fields will lead to an Integrated Video Terminal (IVT) incorporating the home telephone, TV set, video tape recorder and personal computer. According to the International Resource Development Inc. report, the IVT will represent a billion dollar industry within ten years and will cause significant changes in the publishing, consumer electronics, broadcasting and telecommunications industries.

In the report, entitled *The Home Terminal*, the IRD consultants detail current experiments in interactive TV, such as the Qube experiment in Ohio and Viewdata in England. These experiments, according to IRD, point to a strong consumer demand for interactive TV services and will introduce the concept of "narrowcasting", as opposed to "broadcasting", allowing the consumer to select TV programs from central libraries and to view them at times of his own choosing.

According to IRD, the terminal will serve as the primary home tool for: entertainment, publishing access, home environment scheduling, administration (payment of bills, etc.), home appliances control, self-education and correspondence (via electronic mail services).

The IVT is expected to first appear on the U.S. market in 1982, with a price of $1,400.

The eventual impact of the IVT on housing patterns, manners and morals, and the economy in general will be as great as the impacts of the automobile, television, and the national highway system. The pattern of distributed living created suburbia. The telephone network is the nervous system that holds this distributed social organism together. Distributed living, distributed mobility and distributed interpersonal communications support and feed on each other. The IVT will further this process, which will extend it to all social levels as the IVT spreads, according to IRD.

The greatest long term impact lies in the self-improvement and self-learning capacities the IVT gives its users. As these functions are integrated with degree-granting administrations, self-taught and home-tested certification will become the norm for post-graduate adult education. Adaptability to changing labor markets will become a matter of self-initiative, with an easing of social stress, the report said.

Initially IVTs will be sold through retail outlets. In time, as the IVT assumes a greater and greater role in the control of other appliances and as the center of home life, education and correspondence, in addition to its role of entertainment, it will assume the characteristics of the automobile in its marketing mode, with specialized dealer outlets.

IVT sourcing will arise, matching the automobile industry in resources, economic impact and financial revenue. The winners in the race for this eventual giant industry position will probably not be the present home computer manufacturers, and possibly not the present television manufacturers. The best position is held by the vertically integrated companies with solid state computer and consumer manufacturing and sales experience. For information contact IRD at 125 Elm Street, P.O. Box 1131, New Canaan, CT 06840, (203) 966-5615.

European Micro Show

The fourth annual European microcomputer show, Micro Expo 79, will be held in Paris, May 15 to 17. The show has doubled in size and attendence every year, according to show officials.

The technical program held each evening of the show is organized around the themes of personal computing, new products and industrial applications.

For details on attendence and participation, contact Sybex, Inc., 2020 Milvia St., Berkeley, CA 94704.

The Once Over from Down Under

Timothy Mowchauk, Editor of COM-3, an Australian computer-news magazine published by the Essendon School System of Essendon, Victoria, has outlined some computer-buying guidelines for his Australian colleagues. The points that Timothy emphasizes should sound familiar to many American computer buyers who have already been through the press.

"Experience has taught me a number of lessons about buying computers," says Tim in his article appearing in COM-3. "Don't assume anything. *If it is not explicitely stated — then you are not going to get it!* If the contract or advertisement does not say that a case is painted, be assured that you will get an unpainted case!

"The other golden rule is *pay for items — not promises.* Pay for nothing until you receive it. There are sad cases of manufacturers advertising a product. Then they use the money received from orders to begin making that product! In our case, here in Australia, we have one extra problem: shipment from the United States. There are a number of small Australian dealers who will take your money and *then* order the item. They may even wait until they have several orders before ordering the item itself. There is no reason a company with good relations with U.S. suppliers cannot deliver within 60 days!

"New U.S. postal laws concerning mail order items are quite tough. In general they state that any company must deliver goods *within 30 days,* (or an explicitely stated time in the advertisement). The purchaser must be informed of any delay. Penalties for failure to comply with this law are quite tough. Thus, if you order something from an Australian dealer, and the dealer immediately sends in your order, you should get it within 40 days (allowing for air freight). If there is some delay, the U.S. company *must* notify your dealer who should, in turn, notify you. If you wait more than 40 days without word then *cancel* the order! You are definitely being ripped off! The only exception to this is when there is an explicitly stated longer delay time. If this is true, then the dealer will know about it and should have told you *before* you placed the order.

"What type of computer to buy for your school? Well, there is no doubt that I am biased in favor of the microcomputer system. It has all of the computing power needed, and then some. A *simple* system can be had for as low as $1500. Such a system can be upgraded over a period of time to a *complete* system that will do almost any educational (and some administrative) chore in the school. A *full* system with floppy disks, line printer, card reader and batch BASIC should cost no more than $10,000.

"The personal computer is perhaps the most exciting development in the field of computers. Imagine a very powerful computer for less than $1000. I can see the time when timesharing will be a dead issue. Why buy one big machine for $40,000 that will support a 16-user timesharing system when you can buy 16 personal computers for about $16,000? (Note that a terminal for a commercial system often costs more than a personal computer.) At the present time, though, things are still in a state of flux in the personal computer area. The machines are still new. Perhaps we should wait until we see them working and fully debugged."

Micro Aids Handicapped Student

James Renuk, who has cerebral palsy and cannot command his vocal tract to produce speech, is able to "talk" from his wheelchair with the use of a computerized portable communications system.

Renuk is a fourth year student at Michigan State University, where the system was developed. He is a food science major and hopes to become a medical researcher.

The portable system used by Renuk was developed at an MSU laboratory and incorporates a modified Heathkit Microcomputer with a modified Phonic Mirror HandiVoice from Federal Screw Company. The Detroit product is an electronic simulation of the human voice tract.

"WITH YOUR BRAINS AND MY KNOW HOW..."

John B. Eulenberg, associate professor of computer science and linguistics and co-director of the MSU Artificial Language Laboratory, is largely responsible for adapting the university's computer for use by sight and speech handicappers. Eulenberg's linguistics experience enables him to program the computer to speak in a variety of languages, and as a man, woman or child.

To use the system, Renuk feeds into the computer what he wants to say. The computer figures out the code and then translates it into matching audible sounds.

Computerized Employment Service

A computer matches Dartmouth College students with area residents needing workers. A program called Dart-Job helps students find up-to-date listings of available employment, and enables residents and businesses wanting student help to list jobs at no charge.

Since its inception Dart-Job has been in constant use. From four to 100 students per day use the program during a normal college term, says Victoria I. Ball, of employment services.

Response from people seeking student workers has been very good, she says. "People constantly call us because the program provides them with a useful service." From 25 to 75 jobs are on file in the computer each day, and the listings are updated daily.

Prior to implementing Dart-Job, students had to browse through job listings in voluminous books located in the employment services office. Such listings were sometimes difficult to update and organize, but they continue to be maintained for student use in addition to the program.

The computer program materialized because school officials felt people wanted to refer to the job listings after the working day. More than half of Dart-Job's users have sought out its services after regular business hours. The computerized service runs 20 hours each day through any one of the 300 computer terminals on campus and takes minimum knowledge of computers to use.

To use Dart-Job, a student calls the program up on a computer and types into the terminal the kind of job desired. The computer then prints out all available jobs in that category, including pertinent information about wage rates, hours and requirements of the jobs, and lists who each employer is and how he or she may be contacted. The computer lists jobs in full-time, part-time and odd-job categories.

Though many of the jobs listed in the computer are routine — office work, baby-sitting and physical labor — occasionally a job will appear which is out of the ordinary. One job involved driving a group of vacationers to Williamsburg for a week of sightseeing with all expenses paid.

Radio Shack Expands

Plans to open 50 computer sales and service stores in 1978 - 79 were announced by Lewis Kornfeld, president of Tandy Corporation's Radio Shack division.

"While some will be located within new or existing Radio Shack stores, most will be separate entities and all are expected to be in major markets," he said.

The new stores will be called Radio Shack Computer Centers, and their purpose, says Kornfeld, "will be to assist area Radio Shack stores in answering computer questions and closing sales, and to develop quantity sales, principally of Radio Shack TRS-80 Microcomputer Systems and peripheral equipment.

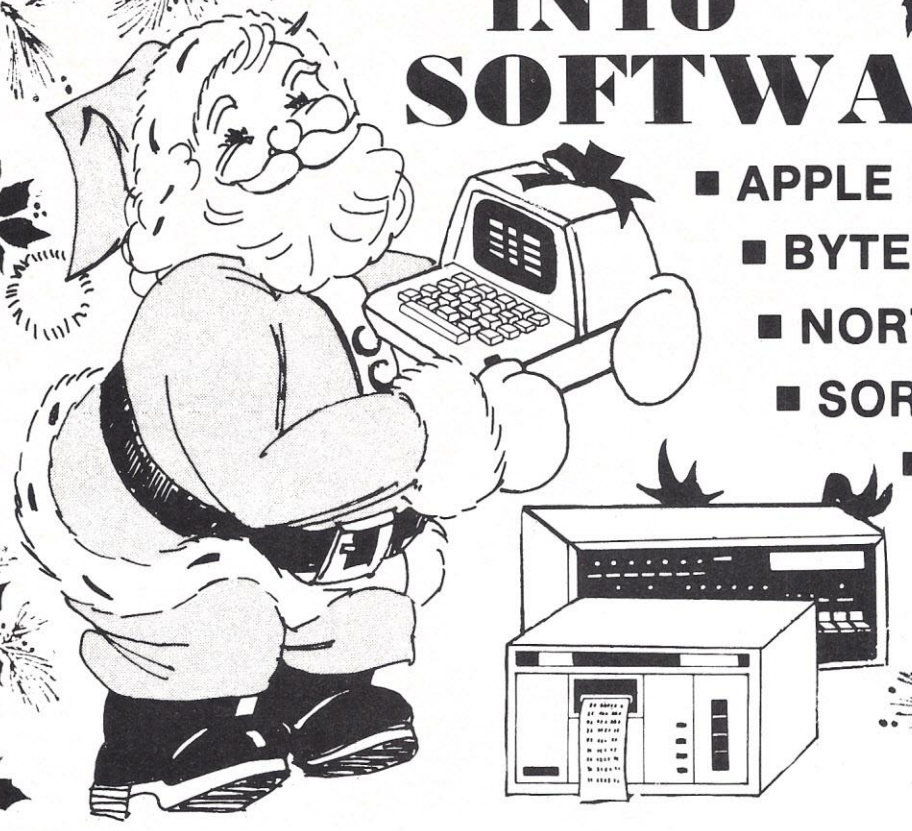
"The stores," Kornfeld continued, "will provide market area service on Radio Shack computer products, thus extending to nearly 100 the number of service facilities operated by Radio Shack in this country, and will include classroom areas where the company can teach computer use and programming to its customers and prospects."

In addition, the new Radio Shack Computer Centers will display and sell "a variety of pieces and parts, as well as packaged software and, possibly, hardware items of makes other than Radio Shack," Kornfeld said.

"We have converted the former Tandy Computer store, located in Fort Worth, into a Radio Shack Computer Center, and are in the process of identifying the other 49 or so cities and exact locations.

"To date we have selected our warehouse store in Garden Grove, California, and our late-fall-opening shop in Chicago's Water Tower Place as two sites for Computer Centers within Radio Shack stores."

SANTA'S INTO SOFTWARE



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CIRCLE 14

Speak to me clearly . . .

BY DAVID GALEF

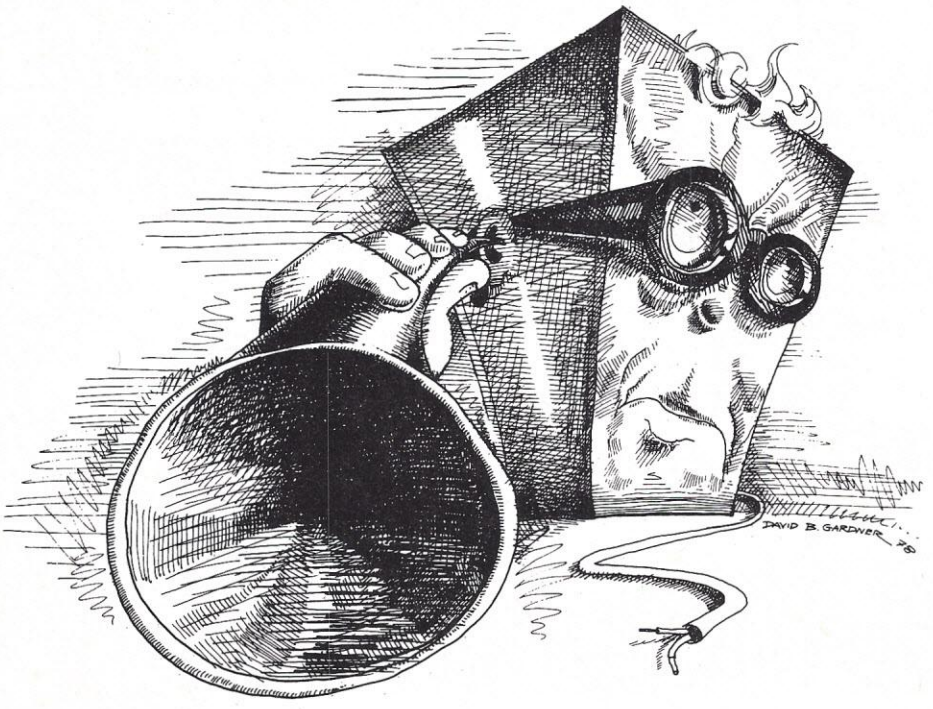


Illustration by David Gardner

The last science fiction story I read described a very convenient device used by the main character: a computer that typed out the comments he spoke into a microphone like a secretary taking dictation. Now, that's quite a trick.

For years, computer specialists have tackled the problem of how to program a computer to analyze the human voice – to "hear" sounds and transcribe them faithfully. They're still working on the problem.

For a number of reasons, some of which are extremely hard to counter, teaching a computer to "take dictation" is going to take quite a few more years.

One major difficulty concerns the difference between the way words look and the way they sound. This problem goes beyond the simple question of how a computer would deal with such phrases as, "though the tough cough ploughs him through". Spelling difficulties can be countered, in part, by feeding a dictionary into the memory.

The real stumbling block is the way we speak; the classic example is the phrase, "to catch pink salmon", which has been studied to death in the interests of science. When analyzed on a sound spectrogram, which is simply a visual portrait of sound energy, two problems arise. One is that many sounds are strikingly similar, so a computer would have its "hands" full just trying to sort out which sounds are which. But, clear enunciation and a sensitive microphone could deal with the situation.

Worry about the other problem instead: the sound spectrogram of "to catch pink salmon" shows a sound break between "ca" and "tch". Furthermore, it shows *no* break between "pink" and the beginning of "salmon". There is more to speech than just hearing, a fact psychologists have known for years. What the secretary hears is not the same as what she understands and subsequently jots down.

Sound spectrography shows an enormous number of words and word combinations. The computer would never even get as far as printing "to ca tch pinks a lmon"; it wouldn't find "ca" in storage and would stop right there. Since this problem is one of language, rather than a fault of the computer, progress is more or less stopped until someone restructures language or someone devises a computer with the analytical powers and experience of the human mind.

Another block, homonyms, poses a more serious problem. A person can differentiate between "write" and "right" with no difficulty at all; the person probably doesn't even think of the other word as he takes down the correct spelling. In order for a computer to perform this function, however, it must know the rules of context and grammar. This necessity enlarges the problem tremendously, since the computer must do more than transcribe automatically; it must make judgments on the basis of numerous, often confusing, rules.

Even if the computer is well-schooled in grammar, homonym difficulties may still arise. Suppose the computer contains all the words in the dictionary, coded by sound so it doesn't have to search through over 600,000 words every time someone utters a syllable. But certain sentences remain perpetually ambiguous, resolved only by the meaning of the paragraph.

Suppose for the purposes of illustration, an exiled Czechoslovakian is seeking a hiding place somewhere. The computer might have difficulty printing the man's question, "Can you cache a bounced Czech?" The example is far-fetched, but numerous more com-

mon, if less humorous, examples abound – for instance, "give me a pair" versus "give me a pear". To make the right choice between these two sentences, the computer would have to analyze and understand the preceding and following dictation, not merely copy it down according to grammatical rules.

The last hurdle is just as hard as the other two: we must assume there is a unique, clear sound pattern for every word. This assumption runs head-on into the problem of accent, intonation and inflection. Presumably, the computer will be able to punctuate properly, if only because the speaker can work out some simple code for punctuation marks. (As it is today, the secretary hears something such as, "Take a letter, Miss Smith. 'Gentlemen colon.' ")

A far greater problem is slurred words, accents and peculiar pronunciations that prevail in business circles, as well as anywhere else. People who have been listening to many types of accents all their lives still have trouble understanding, say, a cockney Englishman for the first time. If the computer is to print "dog", for instance, what is it going to make of such variants as "dawg", "dag", or "dōg"? If all it can do is spell what it receives, and if the word sound is too far removed from what it has stored, the computer cannot print the word.

Machines today respond to simple spoken commands, showing the process is probably possible – some day. But the difference between a few sounds and language is enormous.

Some home computer systems and automatic phone-answering machines will respond to simple sounds such as "AC OFF" (turn the air conditioner off) or "PAW" (a simple sound to jog the machine into playing back phone messages), but the recognition factor can be lower than 70 % – and in the phone machine example, the computer is programmed to work for any "aw" sound, such as "JAW", "SAW", or whatever, indicating only vague recognition. Computer comprehension of speech is still in its infancy.

The outlook is not hopeless. Some computers can synthesize human speech, implying further steps are possible. Then, too, many of the problems discussed might not occur with great frequency in a business letter, where (ideally!) the sentences have few homonyms and ambiguities. A basic vocabulary of a few thousand words might be possible, with special additions for the particular business or firm. At any rate, errors in letters would probably be apparent to the receiver; such errors could be treated the routine way a simple billing mistake is handled nowadays.

Of course, a few of the problems that render speech difficult to transcribe still hold: speech recognition won't happen in the too-near future.

Nonetheless, while many computer scientists have all but given up on the problem of a computer which will translate from one language to another, the computerized secretary is at least more feasible. In only X number of years, you might receive a letter from a prototype model of a computerized transcriber: "DearMrsSmithyouwillbepleasedtohear . . . ."

Oh, well. There are always a few bugs in every system. □

FIRMWARE FACTS

Power Supplies In Retrospect

BY AUSTIN LESEA AND RODNAY ZAKS *of Sybex, Inc.*

In previous articles the S100 power supply system was examined and the pros and cons of local regulation and power distribution were studied. This column examines the mystery of grounding as well as the alternative power-system philosophy of central regulation.

By replacing all regulator chips with a high quality pass-transistor discrete regulator, one can achieve better performance. A single regulator will generally cost less and be more stable; have a tighter regulation tolerance; and be less prone to instability. The only problem encountered is how to get that beautifully regulated voltage into the circuits.

Power distribution now becomes crucial. The resistances of the P.C. traces, connectors, and socket pins also become crucial. Each small resistance implies that voltage loses some of its qualities as it nears its destination. Solving this problem requires, in most cases, nothing more than careful attention to layout and P.C. board rules.

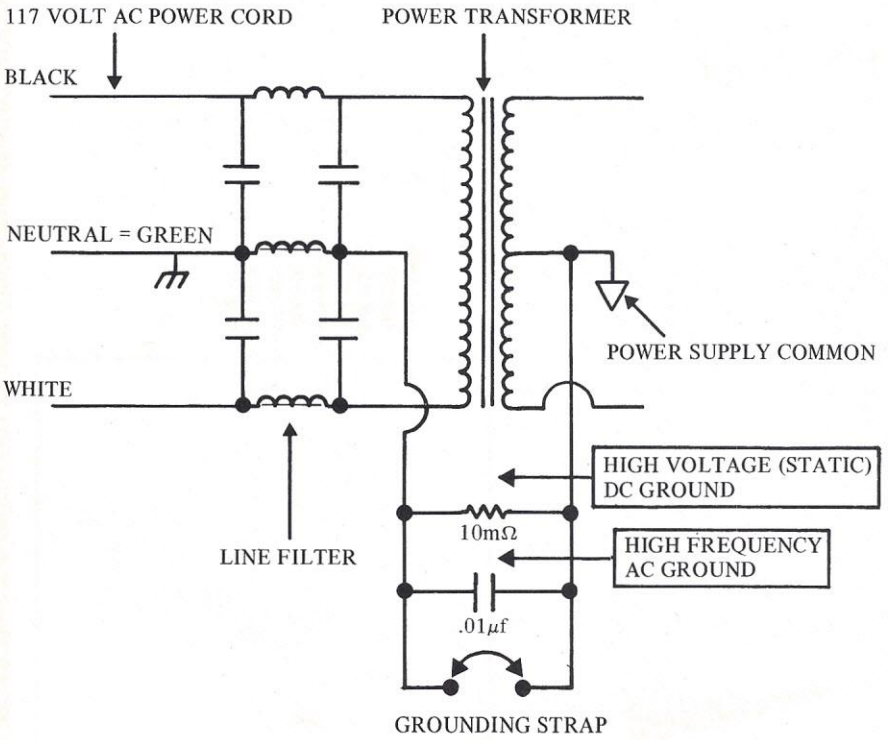
In the event a voltage drop becomes greater than 1/8th of a volt, remote sensing is possible. Instead of regulating the voltage at the terminals of the power supply, feedback is taken from the circuit itself. Separate sense lines go to a typical "center" on one of the printed circuit boards. Such sensing can at times cause instability problems. Usually, though, such sensing will solve even the most difficult power distribution schemes.

Another disadvantage that crops up is cost; a good single OEM supply may cost less than 20 IC regulator chips and "brute force" supply combined. But one does not always purchase all 20 boards for a system. There are no "good" or "bad" power systems, only "good" or "bad" designs and implimentations of a system. In both cases careful attention must be paid to all design parameters.

As a last point, a central regulator may be more efficient if it is of the switching type. Switching regulators chop incoming D.C. into pulses of varying width. These are then filtered by an inductor-capacitor combination. The resulting regulator may then be better than 90% efficient as compared with the 40% efficient linear regulators. The cost of a single switching supply may be more than the cost of an equivalent linear supply, but the increased cost may be quite economical in energy savings. A watt saved is one less watt of heat used up in the computer's box. One less watt may mean the difference between fan cooling or convection cooling. (The cost of the fan must always be added into the system cost.)

In short, if 40% of the development cost was not in the power supply and its supporting components, hold on to

Schematic of a 90% efficient



that design! Few machines can boast of this kind of savings.

In summary, the power supply as a system has been discussed from the basic definitions to two power distribution philosophies. The pro's and con's of supply types and supply schemes have been discussed. The design rules, though general, should provide the designer with a basis for further study. The field of power-supply design incorporates high frequency analog design rules in addition to low resistances, high capacitances, and low inductances. Third order effects as well as mechanical heat distribution must always be the concern of a designer. The heart of the system is power supply. Take some extra time to make sure the first step is the right one.

Now for the mystery of grounding. What, after all, is ground? Is it walked on, connected to, or just a concept?

In an electric circuit, any point can be assigned as a common measuring point. That is, all voltages are measured with respect to that particular point. Way back when the most "common" point was a six foot stake driven into soft salted earth, only a single wire was needed to connect telegraph stations. The return current flowed through the earth itself. Modern communication links do not use the ground as return paths. Telephone equipment tariffs expressly forbid grounding of signal wires.

Why then are things still physically grounded? The third wire of the 3 wire plug goes to the cold water pipe. The cold water pipe comes out of the ground. Physical grounds, or actual grounds, as these are called, are used for protection. Any metal surface of the equipment must be at the same potential as the ground beneath a user to prevent a circuit short from electrocuting that user.

What about the power supply in the computer? The common ground point is not connected to the physical ground except through a protection circuit. This is to prevent "ground noise" from interfering with the CPU operation.

In fact, the ground of an electrical circuit may be floating, where no connection or current flow path exists to the actual ground. This floating ground is then nothing more than a reference point for making voltage measurements.

(In future columns, some light will be shed on cassette tape standards and performance.) □

Does your little black book lose its timeliness quicker than a copy of TV Guide? Then you should try . . .

Phone Directory

BY GARY GREENBERG

"Phone Directory" provides you with rapid access to a phone number without a random access filing system. Written for display on a 40-character screen width (PET), it should easily adapt to any BASIC using the LEN and RIGHT$ functions.

Though the current program will accept 199 names with up to three entries per name, to increase the number of names allowable just increase the 200 in line 110. (Don't forget about the computer's internal memory capacity, since the internal memory stores everything. You might store alphabetic portions in different programs, for example, one for A to L.

Statement ?"CLR" in line 10 clears the screen in PET BASIC but isn't essential to operating the program. A question mark (?) replaces PRINT.

After displaying a question mark, the program awaits a name. It then prints out all entries in which that name constitutes the final part. For example, if you answer letter G, you get all entries ending with G. If you type in a person's last name only, you get all

Program Listing

```
10 ?"CLR":GOSUB300
20 ?TAB(11);"PHONE DIRECTORY"
30 GOSUB300
40 ?TAB(10);"COPYRIGHT 1978 BY"
50 ?TAB(11);"GARY GREENBERG"
60 GOSUB300
70 ?TAB(5);"ANSWER WITH 'END' IF THROUGH."
80 GOSUB 300
90 INPUT M$
100 IFM$="END"GOTO9999
110 FORI=1TO200
115 IFA$="8000"GOTO200
120 READA$,N$,B$,C$,D$:P$=RIGHT$(N$,LEN(M$))
130 IFA$="8000"GOTO200
140 IFM$()P$GOTO200
145 ?:?N$;TAB(35);A$
150 X=LEN(B$):?TAB(39-X);B$
160 IFC$="*"GOTO200
170 X-LEN(C$):?TAB(39-X);C$
180 IFD$="*"GOTO200
190 X=LEN(D$):?TAB(39-X);D$
200 NEXTI
210 GOSUB300
215 RESTORE:A$="1000"
220 GOTO90
230 GOTO9999
300 FORI=1TO39:?"-";:NEXTI:?:RETURN
1010 DATA 1010,"GARY GREENBERG",H-555-2517,
       W-555-3911,*
1020 DATA 1020,"JOHN DOE",212-555-1212,*,*
1030 DATA 1030,"WEATHER",WE6-1212,*,*
1040 DATA 1040,"JOHN Q. BOSS",H-201-555-1212,
      JOE'S TAVERN-212-ROTGUTT W-212-555-1212
1050 DATA 1050,"GARY GREENBERG",H-555-5619,W-555-3911,*
1060 DATA 1060,"LORETTA GREENBERG",W-555-3911,*,*
8000 DATA 8000,*,*,*
9999 END
```

entries containing that last name. If you type in the full name, you get all entries where the full name is the last part of the entry.

Another program feature useful for updating your program entries displays the line number for the DATA statement containing the entry. First entry in the data statement is the line number A$. (I used a string variable to avoid the spacing problems of a numeric variable.) In the sample run under "Greenberg" are two entries for the name Gary Greenberg. One is an update. Such an update would appear if you forgot to check the directory for an existing entry. If you check first, the entry tells you which line to correct. In the sample run we merely eliminate one of the lines.

DATA statements contain five string entires. A$ is the line number; N$ is the entry name; B$, C$ and D$ are information items for the name. I used three, because keeping track of some people requires up to three numbers. B$, C$ and D$ need not be phone numbers, and can contain any information you want. Just remember to use the appropriate syntax for string data entries. In the sample run I used one of the entries to note some additional information about one of my entry's phone numbers. I could use an address or any other data I would like about the person. Line 8000 contains dummy data.

If three entries aren't used, use an * to fill their places. If the name requested isn't in the directory, you draw a blank and new question mark. Use END to terminate the run of the program. □

Sample Run

```
? JIMMY CARTER
? JOHN DOE

JOHN DOE                                1020
                                  212-555-1212
? GREENBERG

GARY GREENBERG                          1010
                                  H-555-2517
                                  W-555-3911

GARY GREENBERG                          1050
                                  H-555-5619
                                  W-555-3911

LORETTA GREENBERG                       1060
                                  W-555-3911
? BOSS

JOHN Q. BOSS                            1040
                                HH-201-555-1212
                          JOE'S TAVERN-212-ROTGUTT
                                  W-555-1212
? WEATHER

WEATHER                                 1030
                                  WE6-1212
? END
```

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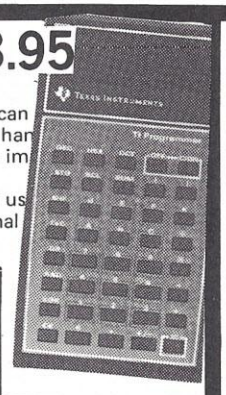

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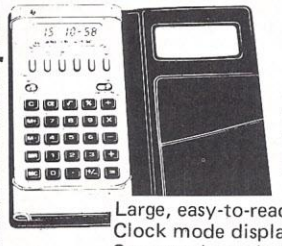

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CIRCLE 17

History of Computing

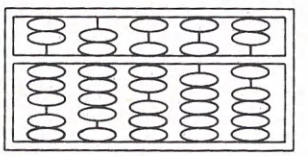
BY DONALD D. SPENCER

Personal computers are only the latest chapters in the history of the centuries-old quest for mechanical extensions of the human mind.

How much do you know about the colorful people and antiquated devices that led to today's home computers? Take this quiz and find out.

Quiz

1. An ancient calculating machine is still used in some Eastern countries to aid in arithmetic computation. It is called

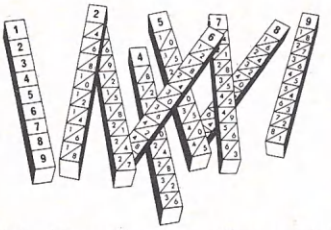


   a. a slide rule
   b. an abacus
   c. a soroban
   d. a bead board

2. The first type of storage used in an electronic digital computer was a
   a. magnetic drum
   b. vacuum tube
   c. magnetic disk
   d. flip-flop

3. Who was the French mathematician who invented the first practical calculating machine?
   a. Blaise Pascal
   b. Georg Riemann
   c. Pythagoras
   d. Rene Descartes

4. The illustration below describes an ancient calculating device called
   a. an abacus
   b. Napier's bones
   c. a slide rule
   d. odometer



5. Herman Hollerith organized the Tabulating Machine Corporation which grew into IBM. His punched cards were first used by which government agency?
   a. Federal Bureau of Investigation
   b. Census Bureau
   c. Internal Revenue Service
   d. Department of Defense

6. One of the most used input media to modern-day computing systems is the *punched card.* In 1801 _____ perfected the drawloom action that has remained basically unchanged to this day. This system used punched cards to control the needles which, in turn, selected the proper threads.

a. Herman Hollerith
b. Basile Bouchon
c. Sir Samuel Morland
d. Joseph Marie Jacquard

7. It was 51 feet long and 8 feet high, tipped the scales at 35 tons, and used 3,000,000 connnections for its 500 miles of wire. Its name?

a. ENIAC
b. IBM System/360
c. Mark 1
d. BIGAC

8. A Chinese abacus would best be classified as

a. an analog device
b. a solid-state device
c. a digital device
d. a mechanical device

9. Which university gave up the fulfillment to many future fund drives when it failed to obtain patents on early computer work done there?

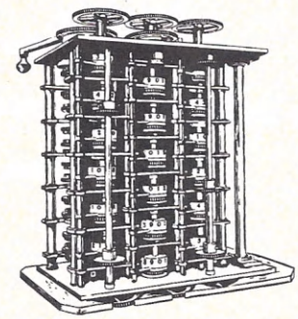
a. Iowa State
b. University of Pennsylvania
c. University of California
d. Boston University

10. J. Presper Eckert and John W. Mauchly are credited with developing the

a. Mark 1, ORDVAC, ILLIAC
b. ENIAC, BINAC, EDVAC
c. EDVAC, Mark 1, ENIAC
d. both b. and c.

11. Shown below is a machine designed by Charles Babbage in 1822. It was called the

a. difference engine
b. differential analyzer
c. card-programmed calculator
d. Babbage calculator



12. True or False: The *Universal Computer* designed by Alan Turing can solve any mathematical problem.

13. The earliest method of storing programs in a computer used tanks containing

a. water
b. punched cards
c. liquid oxygen
d. mercury

14. Who was the Scottish aristocrat who invented logarithms and a multiplication device that was named after him?

a. Leonhard Euler
b. John Napier
c. Albert Einstein
d. Pierre de Fermat

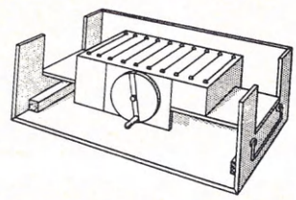
15. A device invented about 1853 by Charles Babbage, an English mathematician, to solve mathematical problems was called

a. a slide rule
b. an analytic machine
c. an adding machine
d. a difference engine

16. A famous German mathematician named _____ developed a calculating machine called a *stepped reckoner* in 1672. The machine treated multiplication as addition.

17. The early calculating machines, such as the Leibnitz Calculator below, were not successful because

a. they were very fragile and parts could easily be broken
b. hand calculations were more accurate
c. the process of making precision machinery was not very effective
d. people did not want to use automatic devices



18. What is the name of the English mathematician who introduced the multiplication symbol and in 1633 introduced the logarithmic slide rule?

a. William Oughtred
b. J. Presper Eckert
c. James Baudot
d. Baron von Liebnitz

19. The Japanese abacus is called a

a. calculating board
b. soroban
c. oriental calculating board
d. calculator

20. A machine built by _____ was made of pulleys, weights and connecting cords for use in predicting tides. The machine, one of the forerunners of the modern computer, gave a physical measurement that was in proportion to the tide at a given time.

a. Blaise Pascal
b. Lord Kelvin
c. Howard Aiken
d. James Maxwell

21. Which of the following logical sequences of development is correct?

a. abacus, ENIAC, FASTAC, modern computer
b. Napier's bones, abacus, EDVAC, ENIAC
c. abacus, Pascal's calculator, ENIAC, modern digital computer
d. ENIAC, desk calculator, cash register, Napier's bones

22. The base 10 (decimal) system is based on:
    a. a Greek philosopher who had ten wives
    b. people having ten fingers
    c. the ten bridges of China
    d. the abacus

23. The person who developed a data processing punched card that used round holes was
    a. James Powers
    b. Herman Hollerith
    c. Joseph Marie Jacquard
    d. Frank Baldwin

24. The person shown was called the father of Boolean Algebra. The British logician is
    a. Keith Carter
    b. Blaise Pascal
    c. Charles Babbage
    d. George Boole

25. In 1931, an American engineer, mathematician, and physicist built the first modern *analog computer*. His name was
    a. Vannevar Bush
    b. Charles Babbage
    c. Blaise Pascal
    d. David Hilbert

26. Who was the American scientist who coined the term *cybernetics*?
    a. Norbert Wiener
    b. Charles Babbage
    c. George Boole
    d. Benjamin Franklin

27. Who was the Harvard University professor who built the first working digital computer in 1944?
    a. Howard Aiken
    b. Charles Babbage
    c. T.J. Watson
    d. George Boole

28. An early machine to use electronic circuits was designed by J. Presper Eckert and John W. Mauchly at the Moore School of Electrical Engineering in 1946. This machine was called the
    a. ENIAC
    b. EDVAC
    c. Mark 1
    d. UNIVAC

29. In 1941_____ completed the Zuse Z3, a machine with many advanced features. This computing machine was destroyed in a bombing raid on Berlin in 1944. After World War II, this German pioneer continued his work in developing computers.
    a. Konrad Zuse
    b. Herman Goldstine
    c. Wernher von Braun
    d. Gherman Titov

30. The computer first to use magnetic core as a storage device was developed at MIT in the early 1950s. It was the
    a. Whirlwind I
    b. IAS
    c. BINAC
    d. IBM 702

31. The man who thought of *THINK* was
    a. T.J. Watson
    b. Charles Babbage
    c. John Doe
    d. Jay Forrester

32. A computer was built by the Eckert-Mauchly Corporation in 1949. It was designed for military applications, had a memory of 512 mercury delay lines, and could multiply or divide two 30-bit values in approximately one millisecond. The name of this machine was
    a. Electronic Delay Storage Automatic Computer (EDSAC)
    b. Binary Automatic Computer (BINAC)
    c. Electronic Discrete Variable Automatic Computer (EDVAC)
    d. Electronic Numerical Integrator And Computer (ENIAC)

33. Name one of the outstanding mathematicians of this century. Born in Hungary, he came to the United States in 1930 to teach mathematical physics at Princeton University. At 28 he wrote a book on the quantum theory, which was one step in developing atomic energy. He built one of the first electronic computers and introduced the idea of storing instructions in the computer's internal memory.
    a. Karl Weierstrass
    b. T.J. Watson
    c. John Mauchly
    d. John von Neumann

34. The first large scale electronic computer available commercially in 1951 was the
    a. IBM 650
    b. UNIVAC I
    c. IBM Card-Programmed Calculator
    d. Bendix G-15

35. UNIVAC stands for
    a. Unit Input-output Computer
    b. Universal Automatic Computer
    c. Universal Vacuum
    d. University of Alaska Computer

36. ABC is the acronym for an early electronic computer built in 1942 by
    a. Sam Smith and John Doe
    b. John Atanasoff and Clifford Berry
    c. John Mauchly and Charles Babbage
    d. Elvis Presley and Blaise Pascal □

Answers on p. 85

Assembler for the PET

BY MARK ZIMMERMANN

Assembly language programming is no more difficult than programming most pocket calculators. This BASIC program lets you write in assembly language on 6502 systems.

In the Commodore PET, the operating system and the BASIC interpreter fill the supplied ROMs to capacity. There was no room left for an assembler, which you'll need to develop and run machine-language programs. An assembler will not only make programming easier and more efficient, but also increase the speed of program execution.

This PET assembler, a BASIC program that takes assembly-language instructions like LDA 17 and STA 32768, Y and translates them to opcodes the 6502 microprocessor understands, fills that need not only for the PET but for other 6502 systems as well. The assembler occupies about 4K bytes of memory (and, by streamlining, should fit into a 4K PET's space). The assembler takes about half a second to interpret each line of your assembly language input (the program you wish to translate). The resulting program can then be expected for rapid output.

This tiny assembler neither makes symbol tables of variables or labels nor allows users to define "macros" (to add such features would greatly increase complexity, length and runtime). The assembler, given the absolute address of the target, calculates, branches and catches most (though not all) of the errors that operators can make with the 6502's various addressing modes. This assembler also contains all 6502 instructions, including the often omitted ROR.

Programming in assembly language isn't difficult; it's like programming most pocket calculators. Assembly language programs, which usually run 10 to 100 times faster than the same programs written in BASIC, are a must for applications where speed is essential. If you've never tried assembly language programming before, see *Programming a Microcomputer:* 6502, by Caxton C. Foster; *How to Program Microcomputers,* by William Barden, Jr.; and the MCS6500 *Microcomputer Family Programming Manual,* from MOS Technology, Inc.

Assembler structure

The assembler (see Program Listing) is written in BASIC; it would be fun to use it to write a machine-language version of itself, but that might be a long project! The BASIC version begins with DATA statements used to initialize the arrays M$, OP, and CA. M$ has 56 elements (numbered 0 to 55) which are the possible mnemonics for the 6502: ADC, AND, . . . , to TYA. For each element of M$, the corresponding element of OP contains the "base opcode". Many instructions have only one possible mode of addressing, and their "base opcode" is the actual (decimal) opcode understood by the microprocessor. Other instructions can have a variety of addressing modes; for example, LDA #27; LDA 32770; LDA 255; LDA (2,X); LDA (34), Y; LDA 47,X; LDA 2001,X; and LDA 1066,Y. For such instructions. the "base opcode" will have some integer added to it, depending on the addressing mode. Adam Osbourne's tables of opcodes and instructions in Volume 2 of his series on microcomputers makes this explicit by showing which bits of the binary instruction change for each mode. (Note that he omits the ROR instruction, however.)

So, M$(0), M$(1), . . ., M$(55) contain the mnemonics, OP(0) through OP(55) contain the corresponding base opcodes, and finally, CA(0) to CA(55) contain the instruction "category". For instance, all "branches" are category 8, a JMP is category 6, etc. The categories identify which instructions go with which addressing modes.

After initializing the mnemonics, opcodes and categories, the assembler asks for the starting address, the location for the output of the assembler to begin at. The PET assembler writes to tape (and to the video display of the PET). It's easily modified to write directly into memory (in fact, that's how the first version I wrote operated), but that's a dangerous modification! If an area of memory not used by the BASIC program itself is written into, users risk that the BASIC interpreter will use that region for string storage or other purposes. Even if an absolutely "safe" area is used, such as the "2nd cassette buffer" region, when the machine-language program has a bug in it, you can't interrupt it without turning power off and losing the whole thing. It's much better procedure to write all but the shortest machine-language programs on tape, where they can be preserved in case of catastrophic failure!

There probably are faster formats for storing the information than the data file the PET assembler writes. But I know my simple method works. After the operating system writes the file header and file name, the file begins with the starting address chosen for the code. The number "999" is used for an END marker.

Lines 100 to 106 get the line of assembly language in. Use the GET command instead of INPUT to allow the instruction to be written in usual assembly language. (Otherwise, you would somehow have to get instructions like LDA 17 in as one string; usually, internal spaces in a string cause trouble if not enclosed in quotes.) ASCII 20, the "delete" command, must be treated specially, as must ASCII 13, the "return" key.

Once the line is in, it's split into a mnemonic part, L$, and an operand part, C$. C$ may be empty, for instructions such as NOP and TXA. The PET scans the list of legal mnemonics, and if it finds the string L$, it puts its number in the array into the variable MN. (If you enter an illegal mnemonic, the computer prints an error message and the program goes back to wait for more input.) Entering the command END closes the tape file (very important!) and ends the program's execution.

Once the computer finds the mnemonic, its category is looked up and put into the variable CA, and the base opcode is stored in OP. (These variables are distinct from arrays with the same name.)

The rest of the assembler program examines the instruc-

Assembler Program Listing

```
1   REM 6502 ASSEMBLER--COPYRIGHT 1978 MARK ZIMMERMANN
10  DATA ADC,97,1,AND,33,1,ASL,2,3,BCC,144,8,
      BCS,176,8,BEQ,240,8,BIT,36,7

12 DATA BMI,48,8,BNE,208,8,BPL,16,8,BRK,0,0,BVC,80,8,
      BVS,112,8,CLC,24,0

14 DATA CLD,216,0,CLI,88,0,CLV,184,0,CMP,193,1,
      CPX,224,4,CPY,192,4

16 DATA DEC,198,2,DEX,202,0,DEY,136,0,EOR,65,1,
      INC,230,2,INX,232,0

18 DATA INY,200,0,JMP,76,6,JSR,32,9,LDA,161,1,
      LDX,162,5,LDY,160,5

20 DATA LSR,66,3,NOP,234,0,ORA,1,1,PHA,72,0,
      PHP,8,0,PLA,104,0,PLP,40,0

22 DATA ROL,34,3,ROR,98,3,RTI,64,0,RTS,96,0,
      SBC,225,1,SEC,56,0,SED,248,0

24 DATA SEI,120,0,STA,129,1,STX,134,2,STY,132,2,
      TAX,170,0,TAY,168,0

26 DATA TSX,186,0,TXA,138,0,TXS,154,0,TYA,152,0

28 REM DATA STATEMENTS ABOVE FOR M$ (MNEMONICS),
      OP (OP CODES), & CA (CATEGORIES)

30 DIM M$(55),OP(55),CA(55):FOR I=0 TO 55:
     READ M$(I),OP(I),CA(I):NEXT I

35 REM CATEGORIES DETERMINE POSSIBLE ADDRESSING
     MODES

40 PRINT "BEGIN AT";:INPUT BE:AD=BE

45 REM BE IS BEGINNING ADDRESS OF ASSEMBLED CODE
     & AD IS CURRENT ADDRESS

50 PRINT "DATA FILE NAME";:INPUT NA$

55 REM ASSEMBLED CODE IS WRITTEN ONTO TAPE

60 OPEN 1,1,1,NA$

65 REM DATA FILE STARTS WITH BE AND ENDS WITH 999

70 PRINT #1,BE

100 PRINT:C$="":A$="":PRINT "? ";

101 REM GET ASSEMBLY LANGUAGE LINE--20=DEL--13=RETURN

102 GET A$:IF A$="" GOTO 102

103 PRINT A$;:L=LEN(C$)

104 IF ASC(A$)=20 AND L<2 THEN C$="":A$="":
      GOTO 102:REM DEL FIRST CHAR.

105 IF ASC(A$)=20 THEN A$="":C$=LEFT$(C$,L-1):
      GOTO 102:REM DEL A CHARACTER

106 IF ASC(A$)<>13 THEN C$=C$+A$:A$="":
      GOTO 102

108 L$=LEFT$(C$,3):IF L<=4 THEN C$="":L=0:
      GOTO 120

109 REM L$ HAS MNEMONIC, C$ HAS OPERAND

110 C$=RIGHT$(C$,L-4):L=L-4:REM L IS OPERAND
      LENGTH

120 MN=-1:REM MN IS MNEMONIC NUMBER--NOW SEARCH
     LIST

130 FOR I=0 TO 55:IF M$(I)=L$ THEN MN=I:
      I=55

140 NEXT I

145 IF L$="END" GOTO 2000

150 IF MN=-1 THEN PRINT "WHAT?": GOTO 100

155 REM MN=-1 MEANS MNEMONIC NOT FOUND

160 CA=CA(MN):OP=OP(MN):REM LOOK UP CATEGORY
      AND BASE OPCODE

200 IF CA=0 THEN POKE 997,OP:BY=1:GOTO 1000

205 REM OPCODES ARE STORED IN 997,998,999
      BEFORE WRITING TO TAPE

207 REM BY=INSTRUCTION LENGTH IN BYTES

208 REM 1000 WRITES TO TAPE

209 REM CA=0 ARE "IMPLIED"  INSTRUCTIONS

210 IF C$<>"A" GOTO 220

213 IF CA<> 3 THEN PRINT "NO":GOTO 100:
     REM CATEGORY 3 FOR ACCUMULATOR OPERAND
```

tion's operand, determines whether it is legal for use with an instruction of that category and then stores the machine-language code for that instruction in memory locations 997, 998 and 999. Those locations are not used unless a second cassette recorder is called upon. If you use a second recorder, you must find another safe location; page 0, locations 0, 1 and 2 are all right if no calls to a user defined machine-language function (USR(X)) are needed.

Once the instruction has been found, the operand has been interpreted and the numbers are stored in locations 997 to 999, the assembler branches to line 1000. The length of the machine-language code for that line of assembly language is stored in the variable BY, which determines the locations to get written to tape.

Lines 1030 to 1050 are necessary for earlier PETs, which did not leave enough space between records when writing data files to tape. These lines can be omitted on later machines, though they do no harm when included. They just give a blip of current to the tape recorder motor to leave a little gap on the tape.

Using the assembler

Once the assembler has been typed in, saved on tape (!) and debugged, you just type "RUN" to start. The beginning address can put the machine language code wherever it does not interfere with other programs that call upon it; the extremely short LOADER program to get it in could be almost squeezed into one line if space is critical. To assemble, just type in the assembly language in standard format, one line at a time, and conclude it with "END". All jumps must be to literal, explicit addresses and all "immediate" instructions must say what constant is to be loaded – no symbols allowed. Branches are calculated by the program; for them, the absolute address of the target statement is input.

Upon receiving the input line, the program translates it and displays the address and the (decimal) opcodes generated. After END, type in or load the LOADER, rewind the data tape, and load it in. It's that simple.

Program Listing continued

```
216 POKE 997,OP+8:BY=1:GOTO 1000
220 IF LEFT$(C$,1)<> "#" GOTO 230
221 REM HANDLE "IMMEDIATE" INSTRUCTIONS HERE
222 POKE 998,VAL(RIGHT$(C$,L-1)):BY=2
224 IF CA=1 THEN POKE 997,OP+8:GOTO 1000
226 IF CA=4 OR CA=5 THEN POKE 997,OP:GOTO 1000
227 REM CATEGORIES 1,4,5 ARE ONLY ONES ALLOWED HERE
228 PRINT "NO":GOTO 100
230 IF LEFT$(C$,1)<>"(" GOTO 260
231 REM CHECK FOR VARIOUS INDIRECT INSTRUCTIONS
232 IF RIGHT$(C$,3)<>"),Y" GOTO 240
233 REM IT IS AN "(INDIRECT),Y"
234 POKE 998,VAL(MID$(C$,2,L-4)):BY=2
236 IF CA=1 THEN POKE 997,OP+16:GOTO 1000
237 REM IF NOT CATEGORY 1, ERROR
238 PRINT "NO":GOTO 100
240 IF RIGHT$(C$,3)<>",X)" GOTO 250
242 POKE 998,VAL(MID$(C$,2,L-4)):BY=2
243 REM IT MUST BE CATEGORY 1, ELSE ERROR
244 IF CA=1 THEN POKE 997,OP:GOTO 1000
246 PRINT "NO":GOTO 100
250 IF RIGHT$(C$,1)<>")" THEN PRINT "NO":GOTO 100
251 REM IT BETTER BE A JMP (INDIRECT), ELSE ERROR
252 IF CA<>6 THEN PRINT "NO": GOTO 100
254 N=VAL(MID$(C$,2,L-2)):HI=INT(N/256):
      BY=3
255 REM HI=HIGH PART OF ADDRESS
256 POKE 999,HI:POKE 998,N-256*HI
258 POKE 997,OP+32:GOTO 1000
260 IF RIGHT$(C$,2)<>",X" GOTO 280
262 N=VAL(LEFT$(C$,L-2))
264 IF N> 255 GOTO 270
265 REM HANDLE "ZERO PAGE,X" HERE
266 POKE 998,N:BY=2:IF CA=2 THEN POKE 997,OP+16:
      GOTO 1000
268 IF CA=1 OR CA=3 OR CA=5 THEN POKE 997,OP+20:
      GOTO 1000
269 PRINT "NO":GOTO 100
270 HI=INT(N/256):BY=3
272 POKE 999,HI:POKE 998,N-256*HI
274 IF CA=2 THEN POKE 997,OP+24:GOTO 1000
276 IF CA=1 OR CA=3 OR CA=5 THEN POKE 997,OP+28:
      GOTO 1000
278 PRINT "NO":GOTO 100
280 IF RIGHT$(C$,2)<>",Y" GOTO 300
282 N=VAL(LEFT$(C$,L-2))
284 IF N>255 GOTO 290
285 REM HANDLE ZERO PAGE,Y HERE
286 POKE 998,N:BY=2
287 IF CA=2 THEN POKE 997,OP+16:GOTO 1000
288 IF CA=5 THEN POKE 997,OP+20:GOTO 1000
289 REM CONTINUE HERE!--SOME ZERO PAGE,Y MUST BE
      TREATED AS ABSOLUTE,Y
290 HI=INT(N/256):POKE 999,HI:POKE 998,N-256*HI:
      BY=3
292 IF CA=1 THEN POKE 997,OP+24:GOTO 1000
```

```
294 IF CA=5 THEN POKE 997,OP+28:GOTO 1000

299 PRINT "NO": GOTO 100

300 N=VAL(C$): REM NOW, FOR NUMERICAL OPERANDS

305 IF CA=8 GOTO 340

306 REM AT 340 DO BRANCHES

310 IF N>255 GOTO 330

312 POKE 998,N:BY=2

314 IF CA=2 OR CA=7 THEN POKE 997,OP:GOTO 1000

316 IF CA=1 OR CA=3 OR CA=4 OR CA=5 THEN POKE
    997,OP+4:GOTO 1000

318 REM CONTINUE ON HERE!

330 HI=INT(N/256):POKE 999,HI:POKE 998,N-256*HI:
    BY=3

332 IF CA=2 OR CA=7 THEN POKE 997,OP+8:GOTO 1000

334 IF CA=1 OR CA=3 OR CA=4 OR CA=5 THEN POKE
    997,OP+12:GOTO 1000

336 IF CA=6 OR CA=9 THEN POKE 997,OP: GOTO 1000

339 PRINT "NO": GOTO 100

340 N=N-AD-2:IF N<-128 OR N>127 THEN PRINT "CAN'T
    BRANCH";N:GOTO 100

342 IF N<0 THEN N=N+256:REM HANDLE RELATIVE ADDRESSING
    & NEGATIVE NUMBERS HERE

344 POKE 998,N:BY=2:POKE 997,OP:GOTO 1000

1000 PRINT AD;:FOR I=997 TO 996+BY:PRINT PEEK(I);:
     NEXT I

1005 REM DISPLAY WHAT WAS RESULTING MACHINE LANGUAGE

1010 AD=AD+BY:REM INCREMENT ADDRESS

1020 FOR I=997 TO 996+BY:PRINT # 1,PEEK(I):NEXT I

1025 REM WRITE TO TAPE

1030 T=TI:POKE 59411,53:REM TURN ON TAPE MOTOR

1040 IF (TI-T)<2 GOTO 1040:REM   FOR (1/30) SECOND

1050 POKE 59411,61: REM TURN MOTOR OFF

1060 GOTO 100

2000 PRINT #1,999:CLOSE 1:END
```

Loader Program Listing

```
 1 REM LOADER COPYRIGHT 1978 MARK ZIMMERMANN

10 PRINT "FILE";:INPUT N$:OPEN 1,1,0,N$:
   INPUT #1,B:PRINT "FROM";B:A=B

20 INPUT #1,C:IF C=999 GOTO 50

30 POKE A,C:A=A+1:GOTO 20

50 PRINT "TO";A-1:CLOSE 1
```

CIRCLE 18 ▶

Computer Crime Compendium

Computer Capers, by Thomas Whiteside; Thomas Y. Crowell Co., 10 East 53rd St., New York, NY 10022; 164 pages; $7.95 hardback.

Electronic criminals, people using computers to carry out their crimes, make off like the proverbial bandit. According to Thomas Whiteside, in his book *Computer Capers*, the average armed robbery haul approaches $10,000; but a computer theft, from a bank for example, can net a thief well over a million dollars.

After all, writes Whiteside, "once someone succeeds in breaking the security of a computer system, large amounts of money are not necessarily any more difficult for him to steal or embezzle than small ones."

Whiteside also notes, "For various reasons, they (computer criminals) are seldom intensively prosecuted, if they are prosecuted at all." One of those reasons is that large banks and corporations, the usual victims of computer rip-offs, do not want the adverse publicity surrounding such a crime. So, according to Whiteside, these crimes often go unreported and unprosecuted.

Because the owners of large computer systems do not like to talk about their experiences with computer crime, its incidence is hard to estimate. Since these people don't want to talk to law enforcement agencies, they certainly don't want to talk to reporters who most assuredly will chronicle those particular computer crimes. Whiteside's success in overcoming these people's reticence allowed him to write a readable and informative book.

One subject no book on computer crime would be complete without concerns the Equity Funding Corporation of America scandal (recently the subject of a TV movie). Here Whiteside brings a unique viewpoint to the story, comparing the perpetrators' creation of fictitious insurance and mutual fund customers with Nikolai Gogol's novel *Dead Souls.*

Another interesting story revolves around the Union Dime embezzlement. In this case, reports Whiteside, "the chief teller of the Park Ave. branch of the Union Dime Savings Bank, between 1970 and 1973, . . . manipulate(d) accounts using a remote terminal at his office so that the bank's computer regularly printed out evidence that the bank's books were in order – which in fact they were, though the accounts themselves weren't. When the fraud was eventually uncovered, in the spring of 1973, it was not because of alertness on the part of the bank management, or because of suspicions held by any of the tellers whom (the chief teller) had been in charge of, or through the supposedly elaborate security safeguards built into the bank's own auditors. Rather, it was because of a police raid on the headquarters of a large bookmaking operation, whose members happened to be the subject of a federal, state and local investigation."

It turned out that the Union Dime teller had embezzled about $30,000 a day to support a losing gambling habit. "He had embezzled more than $1.5 million," reports Whiteside. "None of the money was ever recovered . . . In its place, at the bank, was a set of Union Dime computer printouts that, over the three years of (the chief teller's) criminal activities indicated that the bank's accounts were in perfect balance."

Using a relatively elaborate plan and notes on scraps of paper to keep track of his manipulations, the teller took money from accounts only with large balances (in excess of $100,000) and usually took half the balance – using an error correction instruction. Whiteside said that the embezzler reasoned that unless the customer made a large withdrawal, the chances that the discrepancy would be discovered immediately were relatively small. Obviously, the teller reasoned correctly.

A unique aspect of the Union Dime "caper" was that the embezzler, "though he evidently felt no sympathy for the bank", worried that he would harm the people whose accounts he juggled. And so he made certain that he never took more money from any one account than the Federal Deposit Insurance Corporation (FDIC) would cover.

Whiteside reports, "After his crime came to light, all the losses of individual depositors were, in fact, covered by insurance." The teller pleaded guilty, expressed remorse and drew a sentence of 20 months. He served 15 (getting time off for good behavior).

One other point of interest Whiteside calls attention to is that the teller "had no training at all in computer science, having been given only enough instruction in how to operate a terminal to carry out his normal work."

In his book, Whiteside goes into other cases of electronic theft and embezzlement and computer system security breaches. He talks with security system analysts and describes what some major manufacturers are doing to provide tighter security.

Although he describes each incident in detail he does not interpret or try to extrapolate, to any great extent, what effects on society increased computer crime will have. He does talk about some of the threats to large corporations and governments and of course points out that we are all potential victims of computerized bank robberies. But he does not dwell on the enormous threat to personal privacy posed by thefts of computer records or of the potential problems that a widespread electronic fund transfer system could pose. (A somewhat imaginative thief could tie into an EFT system and, through a remote terminal, drain many accounts. Whiteside does describe far more imaginative thefts than that; so as outlandish as that possibility may seem, it's probably quite real.)

Whiteside's book appeared, for the most part, in the *New Yorker.* Readers of that series will find his book only adds a bibliography and some supporting evidence in the appendices. If you missed the series in the magazine, this short book will provide a neat look into the world of electronic crime.

– Reviewed by H. Paris Burstyn

How Much Memory?

By WILLIAM L. COLSHER

The question of "How much memory do I need?" has plagued personal computerists since the invention of the first computer a quarter of a century ago. It is a question shared by owners of small micro systems and managers of multi-million dollar computer facilities. The answer is equally difficult for both, though the manager may have more experience in handling this sort of question.

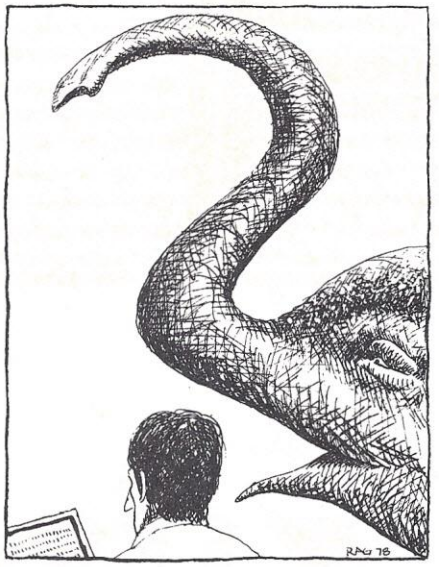
To decide how much memory you'll need you must first decide what you want your computer to do. If you intend to program primarily in BASIC you'll need more memory than with machine language programming.

Learning to program in machine language requires a greater intellectual effort than learning BASIC – not that machine language is any more difficult, but it's in a form suited more to computer's needs than to a human's. Thus to work in machine language you must think in ways that the human mind generally does not think. In addition, machine language programs usually are more difficult to debug and take longer to write.

The major advantage to programming in machine language is the smaller amount of initial memory required. 2K bytes of memory should be enough for learning machine language programming.

If you intend to program in BASIC from the beginning, you'll need a much larger amount of memory. The BASIC program itself will require anywhere from 2K bytes of memory to 12K or more. Additional memory will be required for your program. Here, 4K is minimum (at least in my experience). Later, you can add as much as you can afford. You'll find that you always need "just a little more" than you have for that "special" program.

You should be aware that there are two main types of computer memory. They are Random Access Memory (RAM) and Read Only Memory (ROM); PROM and EPROM are types of ROM. This is important because many systems on the market supply large amounts of software in ROM. A system may appear to have a small amount of memory when in fact it has three or four times that amount when ROM is included. In systems like these, BASIC is usually supplied in ROM – which means all the remaining memory is available for your programs. Thus, providing 4K of user memory is not unreasonable.



Other variables (besides the program language) affect how much memory you'll need. One such variable is the type and number of peripherals you use. Every one of the items attached to your computer will require some software for operation. This software can be incredibly simple for a CRT or similar device. For a long program, several thousand bytes may be required for a complex disk subsystem. For example, on my Digital Group system, the CRT only requires 7 bytes but a tape subsystem requires about 2K bytes.

Another factor that will affect your amount of memory is word size. The most common word length (for microcomputers) is 8 bits (or one byte). Some minicomputers have 12 bit words (like the PDP8) and the IBM 370 has a 32 bit word. Microprocessors are now available that have 16 bit words and the length of word used will probably continue to increase to 64 bits. (Incidentally, there are some large scale systems that use this word length now.) The reason for longer words is that arithmetic is made easier and faster.

Clearly, a computer that deals with a 64 bit word has an eight to one advantage to a system that deals with 8 bit words.

If you intend to program in BASIC, though, word length will probably have very little effect on you. Keep in mind that 4K of 16 bit words is the same amount of storage as 8K of 8 bit words.

Another part of a computer's memory that you'll have to consider is mass storage. This includes things like Phi-Deck tapes and floppy disks. The most important thing to remember about any mass storage device is that you'll need two of them. The reason for this is that sooner or later, you'll have files or programs you'll want to back up. This is absolutely critical if you're doing any kind of business processing or anything of lasting importance. I remember hearing of one fellow at Ohio State who lost most of his Master's thesis data when a disk was damaged. It took him several weeks to re-create the data – all because he hadn't backed it up on tape or another disk file.

A very basic data processing function, sorting, supplies another reason for having two storage devices. Floppy disks are really not very fast and the more of them you have the faster your sorting will go. It will facilitate any processing you do that involves more than one file. Just picture that read head going back and forth across the files on the disk surface and you'll understand the logic behind this. The same goes for tape devices: two are the absolute minimum and more are pure gravy. □

Illustration by Richard A. Goldberg

A BOOK REVIEW

"Programming For Poets"

Glancing through this book you will have to agree with Richard Conway's own words: "This is a book about programming," writes the author in his preface. "For readers who don't expect to do much programming themselves, but who would still like to understand what it is all about. Our objective is to explain what programs are like, without having to require that the reader become proficient in their construction. Our technique is primarily to supervise the *reading* of selected programs, rather than the writing of programs. Programs, are, of course, written in a programming language, and reading them requires a certain minimal literacy in such a language. To achieve this literacy we present a gentle introduction to the basic concepts and constructs of programming, and expect the reader to become comfortable with these ideas by writing some simple programs." And after reading the book you are quite likely to agree with Mr. Conway. To illustrate how well he develops his premise, consider the following extract taken from Part III, "The Nature And Limits Of Programming":

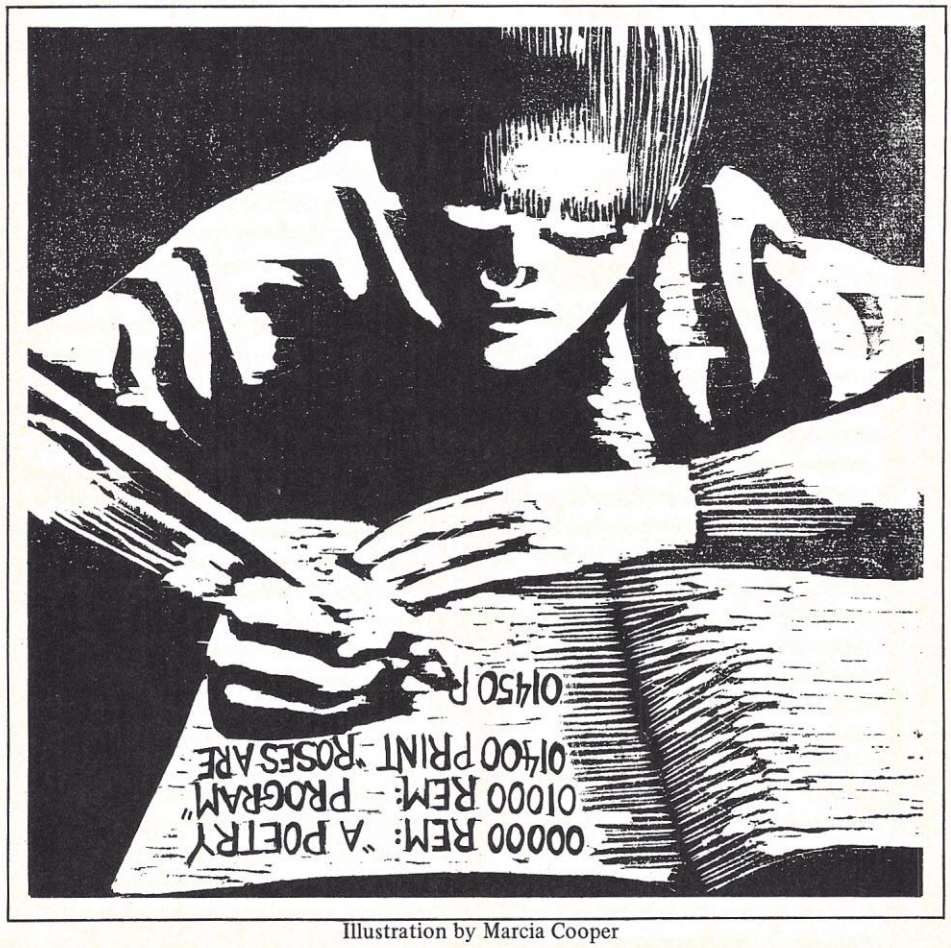
A program is a sequence of statements, written in some programming language, by which a computer is instructed to solve some particular problem. Concentrate on the phrase "written in some programming language". Such a language is presumably a language intelligible to a computer. That means that an algorithm is not a program, simply because it is written in English, and not in a programming language. An algorithm is a sequence of statements to solve a problem, but it is not in a form that can be interpreted by a computer.

There are many programming languages available. Most differ only in the various details; a few languages are quite different. What all programming languages have in common is simply that they are intelligible to some computer. This suggests some interesting questions.

1. Why are there so many different programming languages? (In fact, there are thousands of them.)
2. Can one particular computer understand more than one language?
3. Why do we need special language? That is, why can't a computer understand instructions in ordinary English?
4. Does everyone who uses a computer, "program it"? None of these questions is easy to answer, and our attempts will be neither complete nor rigorous, but perhaps they will help you achieve some insight into some interesting issues.

Let us carefully review and summarize the programming process. Faced with a certain type of problem we devise an algorithm. We then translate the actions

(Richard Conway, *Programming For Poets: A Gentle Introduction Using PL/I.* © 1978 by Winthrop Publishers, Inc., 17 Dunster Street, Cambridge, MA 02138. This book, *Using PL/I,* is part one of a three book series. The other two subjects forthcoming will be on FORTRAN and on BASIC.)



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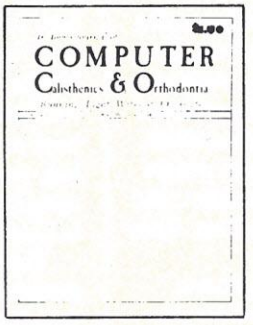

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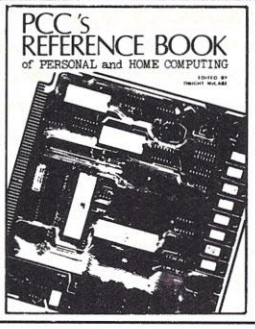

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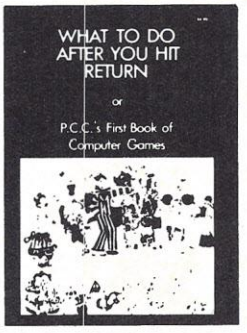

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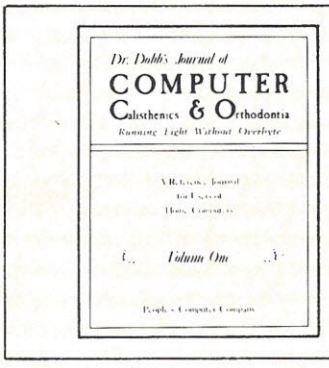

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CIRCLE 20

of this algorithm into the statements of a programming language to produce a program. We load the program into a computer and cause it to be executed. During its execution, the program reads data and produces results.

At this point, we might try to distinguish between a programmer – one who writes a program to solve some class of problem, and a user – one who executes a program to solve one specific example of that class of problem.

In general, the user need not understand the programming language in which the program he uses has been written. He will be given some "operating instructions" for the program, which will specify the form in which input is to be presented to the program. This should seem fairly natural and obvious. It parallels other situations in our experience – some people build automobiles, many more people drive automobiles, and drivers do not need to know much about building them. They only need operating instructions.

Essentially, this is true in computing, and represents a fair description of how the business operates. There are professional programmers who write programs (in languages such as PL/I). There are many other people who use those programs, directly or indirectly, and need to know nothing about how the program was written – indeed, in many cases they are unaware that a program is involved. For example, modern telephone systems are largely computer-controlled, so every time you dial a long distance telephone call you are using a program – that is, you are supplying data to a program, and obtaining output from the program. (In this case, "output" is both a "connection" and billing for that connection.)

There are a number of conclusions that can be drawn:

1. The distinction between a programmer and a user is not really as sharp and clear as we implied previously.

The distinction must rest on the definition of a programming language, and that is very difficult to provide – what are apparently statements of a programming language at one level can turn out to be just data to some program at a higher level.

2. We can invent new programming languages without having to physically build a computer to understand the new language. A language can become a "programming" language just by having someone write a program in some other programming language that is capable of interpreting and executing statements in the new language. The difficulty of this implementation task depends entirely on the complexity of the prospective programming language.

3. Obviously, a single computer can "understand" many languages, since any language it understands can in turn give birth to others.

4. Apparently the complexity of a programming language is related to the flexibility it provides the programmer. For example, PL/I is more complex and harder to learn than PLL, but PL/I can be used over a broad range of problems, while PLL has very limited capability.

5. The converse of point 4 is that anytime one is willing to sacrifice generality, it should be possible to invent a specialized programming language that would be much easier to use. This is, in fact, frequently done.

Other programming languages you may have heard of – for example, FORTRAN, BASIC, APL and COBOL – are also all *translated* languages, in the same sense as PL/I. None is really a native machine language.

In fact, there are many hundreds of different programming languages in use today – almost all of them translated languages. Each different type of computer has its own native "machine language", but there are many more languages than there are types of computers. There are several reasons why there are so many programming languages. The best reason is that it has been found useful to develop special-purpose languages for specific types of problems. But there are also different programming languages just because there are differences of opinion as to exactly how the details of problem specification should be expressed. All these programming languages have much in common – although you would never suspect this to hear programmers argue the merits of their favorite language. These matters are debated with a fervor that would do credit to religious zealots – with perhaps an equal chance of achieving agreement. Nevertheless, the fact of the matter is that general-purpose programming languages have much in common and differ largely in details.

There are excellent books on programming languages available, but perhaps it would be useful to give a brief description of the most widely used languages. The following paragraphs describe FORTRAN, COBOL, ALGOL, PL/I, PASCAL, APL and BASIC.

FORTRAN is an ancient language, dating back to the Stone Age of computing (circa 1956). It was not, as is commonly believed, the first of its kind, but it is certainly the only survivor of the era. It was designed to perform numerical computations for scientists and engineers, but has come to be used much more broadly. In terms of availability on many different types of computers, FORTRAN is the closest thing that exists to a "universal programming language." FORTRAN has now been "standardized" (American National Standards Institute) and that will slow the already glacial pace at which the language is evolving. Other languages have emerged that are at least marginally better than FORTRAN in every respect except the number and tenacity of its users. The problem is basically that FORTRAN was too good an early development. None of its would-be successors has been able to demonstrate a sufficient superiority to convince a majority of FORTRAN users to undertake the task of converting their skills and their program libraries.

COBOL was created in 1959 by a committee of programmers concerned with business data-processing. Envious of the facility that FORTRAN had brought to numerical computation, they devised a comparable language with additional features to process string data, and handle data in large structured files. The result was very successful, and COBOL has also become a National Standard. The language is generally scorned by computer scientists, and is seldom taught in universities, but the fact remains that COBOL is by far the most widely used of all general-purpose programming languages.

ALGOL is actually a series of languages, developed by an international committee of computer scientists, beginning in the late 1950's. In the United States the ALGOL languages have been influential, but not widely used. Unfortunately, ALGOL has become a symbol of a communication gap between the academic computer science community and the professional programmers, both groups feeling (with considerable justification) that the other is nearsighted and parochial.

PL/I was created in the mid-sixties by a joint committee consisting of IBM representatives, and the users of IBM equipment. The new language was intended to serve both the numerical and business communities, and thereby replace both FORTRAN and COBOL. It was also to incorporate some of the ideas (and the elegance) represented by

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ALGOL. The committee had an impossibly short time schedule for their design task, but in spite of this they defined a language that could serve both FORTRAN and COBOL users. (Perhaps given more time, their design might have been more elegant, but it was nevertheless a remarkable achievement.) However, any hope that adherents of FORTRAN, COBOL or ALGOL would desert their prior tongues in significant numbers was doomed to disappointment. Instead of consolidating the programming language situation, PL/I just added a fourth major general-purpose language to the Babel.

These four – COBOL, FORTRAN, PL/I and ALGOL – are the major general-purpose programming languages in use today. Their similarities are really more important than their differences, and historians will surely regard them as members of the same family of languages. There are several other, more specialized languages that deserve honorable mention:

PASCAL is an early-seventies derivative of ALGOL. Unlike the committee efforts that led to the languages described above, PASCAL was at least initially a one-man effort. Its author is Professor Niklaus Wirth of the Federal Institute of Technology in Zurich. PASCAL is not yet widely used outside of the academic community, but its use there has grown rapidly in the last year. It is still a minor dialect, but it has many attractive aspects and will bear watching.

APL is another one-man effort – in this case, by Dr. Kenneth Iverson of IBM. Long a language crying in the wilderness, APL has finally caught on, and has gained a substantial following. In fact, APL advocates seem to be the most zealous of all programming partisans. The language is most suitable for relatively small, short lived problems (its proponents would be outraged at this narrow characterization) but in fact it has achieved use far beyond this type of problem. It has benefitted from the fact that it is part of an effective interactive system, and many of the virtues ascribed to APL are more accurately attributed to its interactive nature. (More precisely, some of APL's popularity arises from the fact that FORTRAN and PL/I are usually available only in a non-interactive batch-processing form, and the interactive APL is attractive by comparison.)

BASIC is another programming language that has benefitted from an interactive environment. Developed at Dartmouth College in the mid-sixties, this very simple and limited language has achieved wide use as an instructional language in secondary schools.

Finally, WATFIV is an alternative compiler for the FORTRAN language, developed at the University of Waterloo. It is efficient for short programs, and emphasizes diagnostic capability. In effect, WATFIV is to FORTRAN as PL/C is to is to PL/I. WATFIV (and an earlier version called WATFOR) are extensively used for instruction in FORTRAN programming.

This brings us to the question of why special programming languages are required – why not use ordinary English to instruct a computer? The answer is surpisingly simple – *no one has been able to produce a compiler for English*, or for any other comparable natural language. This has been an obvious objective for some time, and it has received considerable attention, but no realistic observer has much optimism that it will soon be achieved.

Certain special-pupose languages have achieved a remarkably *readable* English-like syntax. For example, the following are programs written in a data-processing language called ASAP:

```
FOR ALL BOATS WITH BUILDER = 'HINCKLEY'
AND LENGTH = 35, PRINT A LIST OF FILENBR,
BUILDER, LENGTH, RIG, YEAR, PRICE, ORDER-
ED BY PRICE.

FOR ALL BOATS WITH RIG = 'YAWL' AND
LENGTH >= 35 AND LENGTH <= 37, PRINT A
LIST OF FILENBR, BUILDER, LENGTH, RIG,
YEAR, PRICE, ORDERED BY LENGTH, ORDER-
ED BY YEAR, ORDERED BY PRICE.
```

ASAP is a very specialized language – useful only for updating and retrieving information from a file stored on tape or disc. For that particular type of program it is very easy to use, but on the other hand, it would be impossible to write most of the programs from other sections of this book in ASAP. While these query programs are *readable* and understandable as English-like text (without any knowledge of the ASAP language) ASAP is a long way from being able to accept *any* English text as a program. ASAP is rigidly structured, with syntax rules just as strict as those of PL/I. The ASAP syntax happens to have been designed to emphasize readability, but the similarity to English is more apparent than real.

It is not inconceivable that someday a strictly-defined and highly-structured subset of English – perhaps somewhat like what we have been using for algorithms – could be used directly as a programming language. However, by the time enough detail had been included to describe precisely each action to be performed, it is not at all clear that it would be an easier language to learn and use than PL/I. You should realize that in our examples, the algorithms in this book have been shorter and easier to understand than the corresponding programs – not primarily because they are written in an English-like language, but because they *omit most of the details.* If these algorithms were to be used directly as programs, they would necessarily have to be precise and unambiguous. Describing that kind of detail in proper English prose is tediously verbose, and you would soon long for the concise precision of a language like PL/I.

We might note in this regard that English-like readability was one of the design goals of COBOL, way back in the late fifties, and considerable extra verbiage was woven into the COBOL syntax to enhance this aspect of its programs. This turned out not to constitute a compelling advantage, and COBOL's widespread use is attributable to other reasons.

One other interesting development is that English is already *legally* a programming language. Very recently one small computer firm developed a new programming language (similar to ASAP in many respects). They shrewdly named their language "English," *trademarked that name*, and now advertise that their computer is the only one that can be "programmed in English." That may have been a clever marketing gimmick, but it doesn't really alter the situation described above.

It would be appropriate to conclude with some astute prediction as to future directions in programming languages, but our crystal ball is very cloudy in this regard. There will certainly be increasing interest in the development of specialized langauges for certain types of problems – each obtaining greater ease of use by surrendering flexibility. A language like ASAP offers the user such a tremendous advantage – as long as his problems fall within a limited scope – that its use will certainly expand. But the question of future directions for general-purpose languages is much more difficult.

We hate to forecast that our grandchildren will be programming in FORTRAN – it seems comparable to saying

they will be driving Model-A Fords – but every obituary for FORTRAN has turned out to be ludicrously premature. PL/I apparently didn't possess enough advantage to displace FORTRAN, and it may well turn out that PASCAL's advantages relative to PL/I are insufficient. Each of these languages has represented an *evolutionary* improvement, and there is a very strong economic argument favoring stability in this matter. A "break-through" language could appear at any time, but there is no sign of it yet, and forecasting the arrival of break-throughs in any field is a hazardous occupation.

It should be obvious after all this discussion that there really is no clear and sharp distinction between *users* and *programmers.* The extreme situations are clear. Anyone writing statements in machine-language or PL/I is certainly "programming," and anyone supplying straightforward data to a program is hardly programming. But as soon as some of those data provide control values, and thereby exercise some choice and control over the program's actions – then the distinction starts to blur.

Our intention has been to exhibit a wide variety of different ways in which a computer's power can be brought to bear on a problem. Some of these ways could reasonably be called "programming languages," and their users could be said to be "programming," but the distinction is not important. What is important is the following.

First, you should realize that it is relatively easy to develop new programming languages for new classes of problems. For a particular type of problem a specialized programming language may well permit individual problems to be described for computation much more easily than could be done in PL/I.

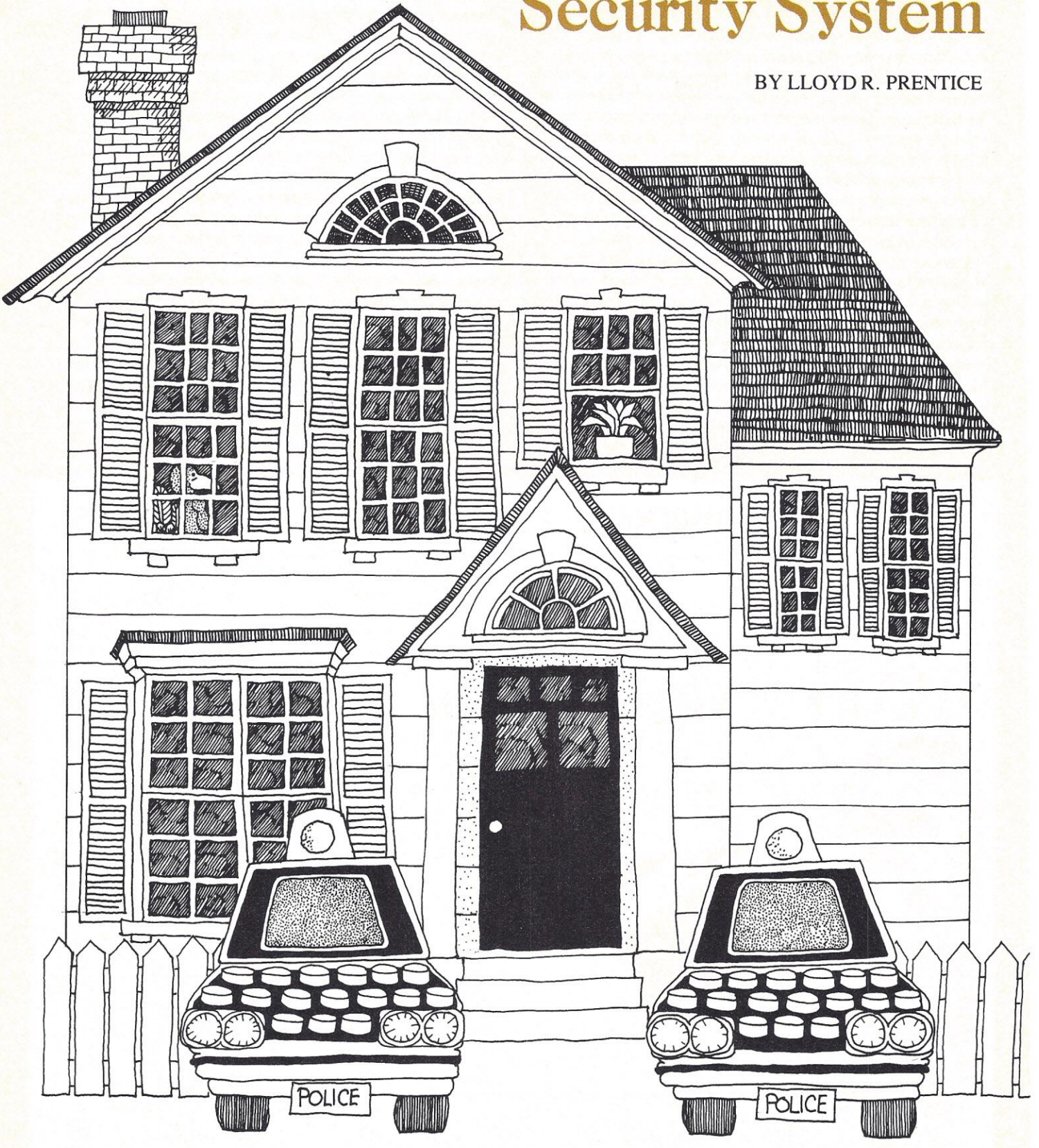
However, the significance of PL/I and comparable languages (such as FORTRAN or ALGOL) is that these languages, although still themselves not true machine languages nevertheless *reflect actual machine operations* sufficiently closely that one can obtain real insight into the inherent nature and capability of the computer. That is, the variables, loops and statements of PL/I are sufficiently representative of what is actually going on in the computer that you can really understand what a computer is capable of doing. You can begin to understand that *only tasks that can be reduced to a sequence of such operations* can be effectively computed.

The special-purpose languages, such as statistical packages or ASAP, work very hard to disguise these basic operations, and consequently such languages tend to exaggerate the mysterious workings of the computer. It helps to keep in mind that *every program in such a specialized language* is actually just *data to some program written in PL/I* (or some similar languages). The underlying PL/I program is reading the "statements" of the apparent user language, and interpreting these commands to control the assignments of values to variables, the executions of loops, etc. – all the operations we have described in numerous examples. The computing process inherently consists of such operations – somehow or other the user's tasks must be described in terms of such a sequence.

The remarkable convenience of various special-purpose languages is actually a tribute to the ingenuity of the people who devise the underlying programs that implement these languages. Through these languages the computer can appear to wear many hats, but underneath this exotic millinery, the basic computing process is still the same. □

Techno Turkey's Home Security System

BY LLOYD R. PRENTICE



One day, not long after the blustery drizzle of late fall had given way to the first white dust of winter, Mrs. Turkey returned home from her karate lesson to find the front door bolted, the shades pulled and a rudely-painted sign planted in the front lawn: "Keep Out! This Means You!"

"Oh no! Not again!" she said.

Knowing full well that pounding on the door was futile, she borrowed a ladder from her neighbor Clutterback and climbed in through an upstairs window. She found her husband Techno Turkey in the darkened bedroom, fully clothed, in bed, with his head buried under a pillow.

"Bit of a relapse, eh, chief?" she said, gently pulling the pillow away.

Turkey was ashen. His body was quaking. His eyes darted up at her pitifully as he yanked the pillow back over his head.

"You've got to face up to this thing, you know," she said, peeling the pillow away a second time.

"He's still lurking out there," Turkey stuttered. "The man with the ax."

"Still dressed like John Alden?" Mrs. Turkey asked sarcastically. "Or did he change his disguise to Ebenezar Scrooge?"

"You don't take this seriously."

"Of course not. It's all in your head, Turkey, and you know it. Besides, you're so stringy he'd break his electric carving knife."

"How can you think such a thing!" squeaked Turkey, stuffing his head back under the pillow.

"I know, I know," said Mrs. Turkey, stroking his listless feathers.

"Besides, how can anyone feel secure in a country where they celebrate two national holidays in a row with . . . with . . . cannibalism."

"To them it's not cannibalism — it's tradition."

"To me it's cannibalism . . . Listen, just the other day a woman pinched my bottom and drooled on my coat while I was standing in line at the meat market — "

"Turkey, I've had quite enough of this. I think you should make another appointment with that nice young psychiatrist you saw last month."

"Nice, my gizzard! The first thing he wanted to know when he got me down on the couch was how much I weighed!"

The big bird barely squeezed by Thanksgiving with his neck intact. To survive Christmas he'd need a computerized home security system.

"I give up!" said Mrs. Turkey. "Being a computer widow is bad enough. But this . . ."

"My computer has nothing to do with this — "

"Wait a minute, Turkey duckling!" A distant gleam filled Mrs. Turkey's eye. "I'm not so sure about that!"

"What do you mean?"

"Remember when you put together the computerized haunted house for Halloween? You kept telling me how easily it could be turned into a home security system."

"I'm listening," said Turkey, slowly drawing his head from under the pillow.

"Maybe now's the time to do it."

"A home security system, eh?" Turkey mused, the flush of interest rising in his wattle.

"Go to it, Tiger!" said Mrs. Turkey, pulling him up from the bed.

"Not a minute to lose!" said Turkey as he tooled out the bedroom door.

Turkey met his friend Dolman for lunch. Dolman was on a case so they rendezvoused at the back table of a pizzeria where they kept the lights notoriously low.

"You're right to think about security these days, Turkey. Some of the stories I could tell — "

"But where do I start?"

"Depends on what you want to protect."

"In this case, me."

"Who'd you cross, Turkey?"

"It's not that exactly — "

"Getting squeezed on your gambling debts?"

"No . . . No . . ."

"Jealous husband gunning for you?"

"No; it's just this feeling I have."

"Maybe you need a little muscle. I could get you a good deal — "

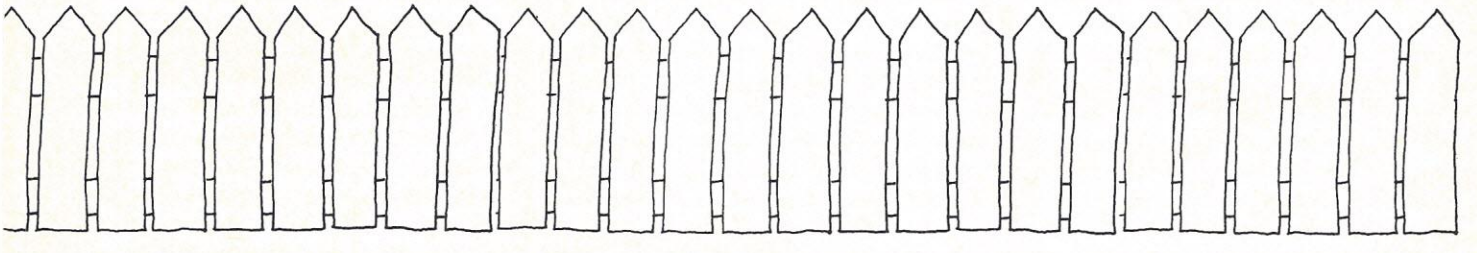
"No, wait, Dolman. I'm thinking about an electronic security system to protect the house."

"What're you trying to protect it from? Intruders? Fire? Flood?"

"Intruders more than anything, but now that you mention it — "

"Pipes freezing, power outages — now that's a biggie these days. I mean, say you've just laid in a side of beef and the compressor conks out on the old freezer."

"Stop already!" said Turkey. "You're beginning to sound like my insurance man."



"You've got to think about these things. Why, just the other day, I saw in the papers where they found a whole family doing the big sleep in their beds — gas leak." Dolman shook his head sadly as he sank his teeth into a slice of pepperoni pizza.

"Alright already. But where do I start?"

"I'm telling you. First you've got to decide what you want to protect and what you want to protect it from."

"I get you," said Turkey.

"Next, you've got to case the joint — where're you most vulnerable? What kind of environment conditions do you have to put up with — "

"What do you mean, environmental conditions?"

"If you live on a busy street, say, ultrasonic motion detectors may not be such hot ideas since heavy trucks will set them off. Same thing if you have pets. Or, say, you're a lousy cook — smoke detectors in the kitchen will fire off the alarm everytime you burn the porkchops. Stuff like that."

"OK, what next?"

"Once you've figured out what you're trying to protect yourself from, you've got three things to worry about: What kind of sensors do you need to pick up possible trouble? What kind of logic are you going to use to sort out the real threats from the false alarms? And, finally, how do you want your system to respond when it decides there's a condition red?"

"What do you mean?"

"You going to wake up the whole neighborhood with a siren under the eaves of your house? You going to use an automatic dialer to call the cops? That kind of thing. Incidentally, some communities have outlawed the use of automatic dialers to call the public safety folks. Too many false alarms."

"There's more to this than I thought."

"There's no panacea, see. Each situation is different. Take intrusion systems, for example. Give some of these wise guys around here enough time and they'll blow Ft. Knox wide open. That's the key, see. A good intrusion system will slow 'em up — make the job more work than it's worth — maybe even confuse 'em or get on their nerves. It's ninety percent psychology. Get me?"

"I'm thinking about using my computer," Turkey said.

Dolman looked at Turkey with renewed respect. "Personally, I'd prefer a savvy beat cop moonlightin' for me."

"Too expensive." Turkey said.

"I guess. Anyway, from what the up-an'-comers are tellin' me lately it looks like computers've got the inside track in the security racket whether I like it or not."

"From what you say, it sounds like my computer could handle the logic problem with no sweat."

"Maybe yes and maybe no," Dolman said, thoughtfully.

"What do you mean?"

"The good news is that when it comes to intelligence your computer is probably the next best thing to a well-trained German shepard. And with the kind of punks walking around these days you need a smart alarm system to stay two jumps ahead of 'em."

"Smart alarm system?"

"Let's say you have intrusion sensors in your kitchen, your dining room

and the stairs leading up to the bedroom. Each night you arm the whole system before you hit the pillow."

"Sounds pretty secure."

"But suppose you're a sleep walker or you go down to the kitchen to get something to settle your stomach at two in the morning."

"I get you, you might accidently trip the alarm — "

"Yeah. Do that once too often and it's like the little boy crying wolf."

"You got a point there."

"So, the way I see it, your computer could keep track of patterns of movement through the sensors. Once armed, if someone moves through the perimeter from the outside it calls the cops with no questions asked. But, if there's routine movement inside the house, it just watches very carefully to make sure there's no monkey business before it gets all excited."

"Good idea!" said Turkey, squirming in his chair with growing enthusiasm. "My computer could manage that!"

"Also," Dolman continued, "Your computer could keep a real-time log of when each sensor is triggered. This'd be useful if you need to reconstruct the crime in case the cops arrive too late. Even more important, it might tell you who's raiding your liquor cabinet and when."

"Yeah! Yeah!" Turkey said, spraying pizza crumbs across the table in his excitement. "My computer could do all that easily!"

"But, you pay a price." Dolman interrupted.

"What's that?"

"Your security system is only as secure as your computer."

"What do you mean?"

"What happens if the power goes out? Or what if your uninvited guests cut the power mains servicing the house before they bust in?"

"I see what you mean" said Turkey, apprehension rippling across his face.

"Not that these problems are insurmountable. You just have to think about 'em, get me?"

"Yeah, Turkey said thoughtfully, pulling out his wallet to pay the bill. "You've given me a whole lot to think about, Dolman — "

"My pleasure, kid. Listen — " Dolman reached across the table and touched Turkey's wing. "The missus and me would like to have you for dinner some night — "

"Come again?" Turkey asked warily.

"The missus and me would like to have you for dinner — "

"That's what I thought you said — " Turkey replied, blood draining from his wattle.

"What's the matter, kid?"

"Nothing — " Turkey stammered, slowly backing away from the table. "Not a thing," he said as he turned and bolted, nearly colliding with the waiter who was carrying a tray of antipasto and minestrone soup to the next table.

"Strange bird, that Turkey," the surprised Dolman thought, shaking his head as he watched his feathered friend disappear into the grey slush outside the restaurant.

But Turkey didn't bolt for home. He got a grip on his nerves and headed for the public library. By the time he got to the card catalog his pulse was almost normal. He found several books on the topic he wanted and settled down for an afternoon of research. But before

opening the books he scribbled a list of possible threats to the security of his household on the inside of a matchbook folder: 1) intruder, 2) smoke, 3) fire, 4) flood, 5) freezing (pipes), 6) unfreezing (refrigerator freezer), 7) gas leaks.

As Turkey worked his way through the books he discovered that there are three basic types of intrusion detectors: perimeter, volume and object.

Perimeter detectors use electromechanical switches and photo relays to create a kind of electric fence around the area to be protected, with particular care devoted to points of entry such as doors, windows, skylights and large air-conditioning and heating ducts. Volume detectors use ultrasonics, microwaves and other principles to detect motion within a room or defined space. Object detectors use proximity detection techniques to protect file cabinets, wall safes, jewelry boxes and so forth.

Turkey also found ample information on sound, smoke and water detectors as well as devices that detect both fire and freeze conditions.

Most important, Turkey discovered that all the sensors he would need were available as off-the-shelf commercial products and that most of them terminated as either relay or switch closures.

"Now the input problem," Turkey mused as he gathered up his notes. "I'm going to have dozens of sensors around the house feeding information into my computer — how am I going to handle all those input lines?"

Turkey decided to stretch his legs a bit. He stood up and started wandering among the rows of books.

"A large number of switches all feeding into my computer at the same time . . . " Turkey mumbled to himself as he made his way past the section on hydrodynamics.

"Might need a lot of input ports," he thought as he brushed past books on hydrogen bombs and hieroglyphics.

Now it just so happens that Turkey came out of the stacks near the checkout desk. And at that moment the librarian was pecking at the terminal hooked into the interlibrary loan network.

"Of course!" said Turkey when he saw the librarian's fingers dancing across the keys.

"It's easy!" he thought as he rushed back through the stacks to pick up his notes.

"I should have thought of that right away!" he fairly shouted as he bumbled into a truck driver studying up on interstate commerce.

"Watch where you're going, Butterball!" shouted the truck driver, but Turkey was far too self absorbed for the insult to even register.

When Turkey returned home he rushed down to his computer lair. Buried in a pile of printout he found a dog-eared copy of *Microprocessor Interfacing Techniques* by Austin Lesea and Rodney Zaks. Flipping the pages, he found just what he was looking for — a scheme for interfacing a non-encoded 16-switch calculator-type keyboard to a microcomputer.

In this scheme, the keyboard is wired into an eight-bit I/O port as shown in Figure 1. The row and column lines go to one eight-bit port of a standard programmable I/O chip such as the 6820 or the 8255. The four bits connected to the column lines are configured for output. The four bits connected to the row lines are configured for input. A sequence of "walking ones" is put out to the column lines and the row lines are sensed for coincidence (see Figure 2). When a switch closure is detected, the processor waits about 20 milliseconds and checks the switch again.

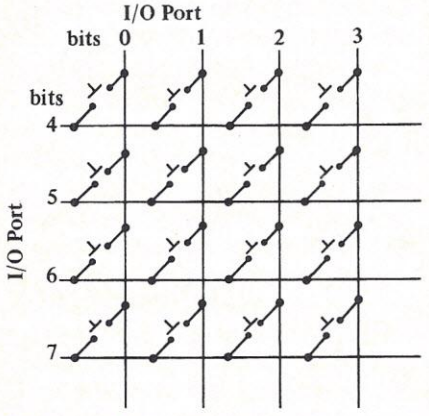


Figure 1 wiring of 16-switch keypad

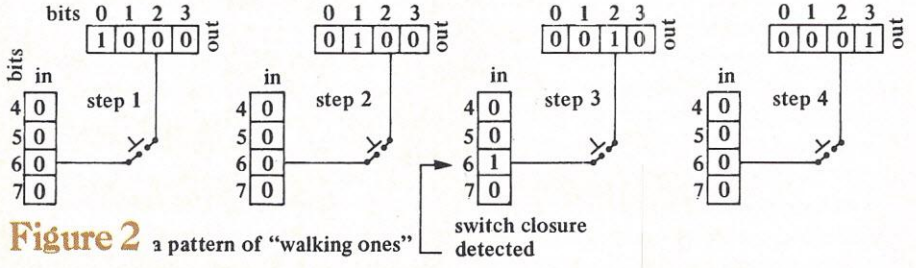


Figure 2 a pattern of "walking ones"

Checking the switch status this second time after a brief delay assures that the processor is not being hoodwinked by a pernicious problem of mechanical switches, called "bounce". When mechanical switches, including relay contacts, are closed, they take some time to decide what state they're in. This brief period, during which the contacts are literally bouncing up and down against one another, is called, well, bounce. Look, nobody's perfect.

Anyway, as Turkey studied the diagram on page 89 of Lesea and Zaks, he chuckled smugly at his own cleverness. What does the computer care if one of those switches in the matrix is a relay contact controlled by an off-the-shelf intrusion or fire detector, he asked himself rhetorically. It doesn't give a tin hoot or a hill of beans! And, further, what does the computer care if we have a whole keyboard that is untouched by human hands — a "virtual" keyboard where one "key" is actually an ultrasonic motion detector, another is a photo relay and still other "keys" are hooked to smoke, fire or freeze detectors? It could care less, Turkey concluded. "And this gives me a very simple way of sensing up to 16 security devices with only one port!" Turkey said aloud to nobody in particular.

At this point, Turkey had a second inspiration. "I'll use two ports! One will be hooked up to the security devices and the other to a real 16-switch keyboard. I can use this keyboard to arm, disarm and program the whole kit and kaboodle and that, my dear Dr. Watson, takes care of the input problem altogether!"

Before tackling the logic problem, Turkey decided to think about output. First, he dug out one of the power control boxes that he'd built for the haunted house. "No need to make any hardware changes here," he thought. "But what do I want to control?"

Turkey considered several situations. If the man with the ax showed up he wanted to scare the dickens out of him and alert the police. This plan called for a siren, an automatic dialer and maybe a few clever electronic countermeasures like flashing strobe lights and excruciating sounds from cunningly hidden speakers.

On the other hand, if anyone in the family came home late at night when no one else was home, it might be nice for the computer to turn on a few lights and maybe start up the coffee pot as soon as it heard from the automatic garage door opener.

If the fire and smoke detectors go

off, Turkey figured, he'd better have the computer sound buzzers in the bedrooms and call the fire department.

Flood and freezer monitors should trigger trouble lights at several places in the house and then, if an acknowledgement is not entered into the real keyboard within a certain period of time, the computer should instruct the automatic dialer to start calling trusted neighbors.

"OK, how does the computer tie all this together?" Turkey asked himself. "Suppose the man with the ax comes in through the basement window?" With this thought Turkey felt a shiver of anxiety ripple up his spine. "Or what if he uses the ladder to climb in through the bedroom?" Now Turkey's mouth felt dry as cotton. "Or what if he jimmies the front door?" Suddenly Turkey felt the feathers on the back of his neck stand straight on end.

When Mrs. Turkey looked in on her husband a few minutes later she found him hiding under the desk.

"What's the matter?" she asked.

"Call the Wizard," he squeaked sheepishly. "There's only one way I can get this software worked out."

And so, dear reader, this is how Techno Turkey used his computer to protect his neck. It all worked fine — except for the one night Mrs. Turkey returned home late from her karate lesson and forgot to properly disarm the system. Turkey, roused from sound sleep by wailing sirens and flashing lights, dived under the bed without a second thought. Mrs. Turkey, startled by the countermeasures, tripped on the hall rug and injured her foot. If you haven't seen them lately, Turkey's sporting two golden goose eggs on the top of his head — one from the frame of the bed and the other from Mrs. Turkey. And Mrs. Turkey's still wearing a cast. □

Program Notes from the Wizard

BY PETER D. HENRY

When Techno Turkey first came to me with the idea of programming a home security monitor in BASIC, I saw one problem: speed. In a real "relays 'n' whistles" alarm system all devices are monitored all the time whenever the system is armed. Without extensive hardware, a computer cannot really do more than one thing at a time. It can, however, do a sequence of things so fast that, from a human's point of view, the computer is doing them all nearly simultaneously.

Now, in machine language, this sort of rudimentary time-sharing is possible and even simple. Machine language has two major disadvantages, though. The major one is readability: machine language, when written out, is difficult to follow in its logic. The second problem is compatibility. For the program to be useful to as many people as possible, I would have to write different versions of the program for the three major microprocessors — the 6800, the 8080 and the 6502.

Though more convenient than machine language, BASIC is hundreds, or even thousands, of times slower. And speed, if we're going to protect Turkey's neck, is of the essence. Therefore I summoned all my patience and wit to find the fastest possible techniques for checking the input sensors, given minimal hardware.

Most of the documentation for the program follows, since REMarks in the program cause noticeable slowdowns.

Incidentally, even though this program is optimized for speed as much as possible, some BASICs may still be too slow to handle the minimum speed requirements. Most notable of such BASICs is that for the Southwest Technical Products 6800 system. For slow BASICs, you'll have difficulty implementing a security system such as this one unless you add extensive hardware. In these cases, machine language is about your only resort. Therefore, I'm making the machine language version available, written for each of the following processors: 6800, 8080, 6502, Z-80, 2650. Send a stamped, self-addressed envelope to *Personal Computing* magazine. *(We'll forward all inquiries to Mr. Henry for his reply. — Editors)*

The logical sequence of the program is straightforward. The program does three things: 1) virtual and real keyboard scanning, 2) event logging/alarm triggering and 3) pattern scanning/checking.

The keyboard scanning must be executed as fast as possible. I found that Boolean logic statements (AND, OR, NOT) work faster than arithmetic statements, so I used them to help determine which sensor devices are activated. The "walking one" keyboard scanning method described in Figure 2 speeds things up considerably.

Event logging, alarm triggering, system disarming, and pattern scanning/checking can only be performed when a keyboard sensor is triggered. Therefore, these routines work independently of the keyboard scanning program.

Pattern scanning and matching capabilities of a computer bring incredible flexibility to a security system. These capabilities give the alarm system intelligence — that is, rather than having a one-to-one relationship between sensor activation and alarm triggering, the computer can look for certain patterns in the way several different sensors are triggered before it sets off the alarm. And the programability of the computer allows you to change the patterns easily.

With this program there can be up to five patterns and up to ten steps per pattern. The variable dimensions look like this:

P(5,10) — Up to five patterns, up to 10 steps per pattern. For example, P(3,6) means the sixth step of the third pattern.

S(5) — Number of steps in each of the five patterns. Zero indicates an inactive pattern.

C(5) — Current position in running pattern. One counter per pattern.

A(5) — Action to be taken when a pattern is matched. When a pattern is matched, some action is to be programmed. This particular action is specified by an "action-code" number stored in a variable. I used one variable for each of the five patterns; A(X) holds the action-code for pattern X.

Possible values for the action-code:

0.— Do nothing.

1.NN— Arm the system after NN seconds.

2.NN— Trigger alarm after NN seconds. Caution: another stimulus could

Program Listing

by PETER D. HENRY

```
100 REM SECURITY MONITOR PROGRAM BY PETER HENRY, 1978
110 DIM P(5,10),P1(5,10),C(5),C1(5),A(5),A1(5),S(5),S1(5),L(200)
120 REM DIM SETS ALL DIMMED VARIABLES TO 0...
130 F=0
135 A9=0
140 T=0
145 R2=0
150 R=0
160 R1=-1
165 F=-1        'IF ALARM SHOULD GO OFF, IT WILL BE FORCED OFF AFTER 10 MIN
170 D=0
180 L=0
185 L1=0
190 REM QUERY USER FOR PATTERN NUMBERS (FOR EACH PATTERN)
200 FOR A=1 TO 5
210 PRINT "PATTERN";A;
220 INPUT L0
230 GOSUB 6000        'LOAD P(A, ) WITH PATTERN NUMBER L0
240 NEXT A
250 PRINT "ACTION BANKS (REAL, VIRTUAL)";
260 INPUT A1,A2
270 RESTORE 7060
280 FOR A=1 TO A1
290 FOR B=1 TO 16
300 READ D(B)
310 NEXT B
320 NEXT A
330 RESTORE 8000
340 FOR A=1 TO A2
350 FOR B=1 TO 16
360 READ B1(B)
370 NEXT B
380 NEXT A
390 PRINT "KEYBOARD I/O PORT NUMBER (REAL, VIRTUAL)";
400 INPUT I,I1
410 PRINT "ALARM OUTPUT PORT NUMBER";
420 INPUT O
430 PRINT "OUTPUT VALUES TO TURN ALARM ON, OFF";
440 INPUT O1,O0
450 REM    - SCAN VIRTUAL KEYBOARD
460 OUT I1,15
470 V=INP(I1) AND 240
480 IF V=0 THEN L=0:GOTO 630  'SKIP WALK-THRU IF NOTHING PRESSED.
490 REM 20MSEC DELAY SPECIFIED IN ARTICLE IS BUILTIN BECAUSE OF
495 REM RELATIVELY SLOW SPEED OF BASIC.
500 P=1
510 B=0
520 FOR B=1 TO 4
530 OUT I1,P
540 V=INP(I1) AND 240
550 IF V<>0 THEN B=VIT=T+.006:D1=B   'T IS THE OFFSET VARIABLE.
555 REM T VALUES (OFFSETS) WILL HAVE TO BE CHANGED FOR YOUR SYSTEM.
560 P=P*P
570 NEXT B
580 T=T+.4
590 IF B=0 THEN 680   'NO KEY PRESSED... MUST HAVE BEEN A BOUNCE.
600 IF V=16 THEN S2=4:T=T+.009
610 IF V=32 THEN S2=3:T=T+.009
620 IF V=64 THEN S2=2:T=T+.009
630 IF V=128 THEN S2=1:T=T+.010
640 S=(D1-1)*4+S2
650 GOSUB 1350   'VIRTUAL ACTION INTERPRETER...
660 T=T+.09
670 REM    - SCAN REAL KEYBOARD...
680 OUT I,15
690 V=INP(I) AND 240
700 IF V=0 THEN L1=0:GOTO 890  'SKIP WALK THRU IF NO KEY PRESS.
710 REM 20MSEC DELAY IS BUILT IN AS BEFORE
720 P=1
730 B=0
740 FOR B=1 TO 4
750 OUT I,P
760 V=INP(I) AND 240
770 IF V<>0 THEN B=V:D1=B:T=T+.006
780 P=P*P
790 NEXT B
800 T=T+.4
810 IF B=0 THEN 890    'NO KEY PRESSED... MUST HAVE BEEN A BOUNCE...
820 IF V=16 THEN S2=4:T=T+.009
830 IF V=32 THEN S2=3:T=T+.009
840 IF V=64 THEN S2=2:T=T+.009
850 IF V=128 THEN S2=1:T=T+.009
860 S=(D1-1)*4+S2
870 GOSUB 1450   'CALL REAL KEYBOARD ACTION INTERPRETER
880 T=T+.09
890 T=T+.2
895 IF R1=-1 THEN 460  'IF DELAY IS DISABLED THEN JUST SCAN AGAIN...
900 R1=R1-T
910 B=B+T
915 L5=L5-T
920 T=0
925 IF L5<0 AND L5<>-1 THEN GOSUB 2100
930 IF R1<0 THEN GOSUB 1600  'PERFORM ACTION IF DELAY IS OVER...
940 GOTO 460   'KEEP ON SCANNING!!!
950 REM VIRTUAL KEYBOARD RESPONSE...
960 IF L=S THEN RETURN  'SKIP IF BUTTON IS BEING HELD ON...
965 L=S     'SET SWITCH BUFFER TO THE # OF THE ONE JUST PRESSED
967 IF D(S)=0 THEN 990
970 R=INT(D(S))      'SET UP DEFAULT ACTION
980 R1=(D(S)-R)*100
985 IF R1<>INT(R1) THEN R2=(R1-INT(R1))*100:R1=INT(R1)
990 REM CHECK PATTERNS
1000 T=T+.01
1010 FOR C=1 TO 5
1020 IF S(C)=0 THEN 1130  'SKIP IF LENGTH=0 (INACTIVE PATTERN)...
1030 E=1
1040 IF P(C,C(C))=S THEN C(C)=C(C)+1:GOTO 1100  '(WHEW!!)
1050 C(C)=1
1060 E=E+1
1070 IF E<=2 THEN 1040 'CHECK TWICE TO MAINTAIN SYNCHRONIZATION...
1080 T=T+.1
1090 GOTO 1130  'GOTO NEXT C
1100 IF S(C)<C(C) THEN T=T+.02:IF A(C)<>0 THEN R=INT(A(C)):R1=(A(C)-R)*100
1105 IF R1<>INT(R1) THEN R2=(R1-INT(R1))*100:R1=INT(R1)
1110 GOSUB 3000  'LOG ACTION ENTERED
1120 T=T+.06
1130 NEXT C
1140 RETURN
1150 REM REAL KEYBOARD RESPONSE
1160 IF L1=S THEN RETURN 'SKIP IF BUTTON BEING HELD ON
1165 L1=S     'SET THE SWITCH BUFFER TO THE # OF THE ONE LAST PRESSED
1167 IF D1(S)=0 THEN 1190
1170 R=INT(D1(S))    'SET UP DEFAULT ACTION
1180 R1=(D1(S)-R)*100
1185 IF R1<>INT(R1) THEN R2=(R1-INT(R1))*100:R=INT(R1)
1190 REM CHECK PATTERNS...
1200 T=T+.03
1210 FOR C=1 TO 5
1220 IF S1(C)=0 THEN 1330  'SKIP IF LENGTH=0 (INACTIVE PATTERN)...
1230 E=1
1240 IF P1(C,C1(C))=S THEN C1(C)=C1(C)+1:GOTO 1300
1250 C1(C)=1
1260 E=E+1
1270 IF E<=2 THEN 1240   'CHECK TWICE AS ABOVE...
1280 T=T+.1
1290 GOTO 1330  'GOTO NEXT C
1300 IF S1(C)<C1(C) THEN T=T+.02:IF A1(C)<>0 THEN R=INT(A1(C)):R1=(A1(C)-R)*100
1305 IF R1<>INT(R1) THEN R2=(R1-INT(R1))*100:R1=INT(R1)
1310 GOSUB 3500  'LOG IT
1320 T=T+.07
1330 NEXT C
1340 RETURN
1350 IF R<0 OR R>6 THEN R=0
1360 RETURN
1370 REM   NOT MUCH OF A SUBROUTINE, BUT IT'S THERE SO YOU
1380 REM CAN EXPAND IT TO YOUR NEEDS LATER...
1450 REM REAL KEYBD.  ACTION TRANSLATOR/ INTERPRETER FOLLOWS...
1460 IF R<0 OR R>5 THEN R=0
1470 REM ABOVE FORCES AN ILLEGAL OPERATION TO A DO-NOTHING OP.
1480 IF R=5 THEN R=8
1490 IF R=6 THEN R=7
1500 IF R=2 THEN R=1.5
1510 IF R=1 THEN R=2
1520 R=INT(R)
1530 RETURN
1600 REM PERFORM ACTION SUBROUTINE...
1610 IF R<0 OR R>8 THEN R=0
1620 ON R+1 GOSUB 1700,1800,1900,2000,2100,2200,2250,2300,2400
1625 R1=-1:R=0
1630 RETURN
1700 REM DO NOTHING SUBR.
1705 T=T+.03
1710 RETURN    'THAT SURE WAS NOTHING!!!
1800 REM ARM SYSTEM....
1805 T=T+.04
1810 A9=1
1820 RETURN    'AGAIN, SIMPLE, BUT YOU CAN EXPAND IT TO SUIT YOUR NEEDS.
1900 REM TRIGGER ALARM
1905 T=T+.08
1907 IF A9=0 THEN RETURN 'DON'T TURN IT ON IF SYSTEM IS DISARMED!
1910 L5=600   'ALARM CAN'T LEGALLY STAY ON FOR MORE THAN 10 MIN. IN SOME STATES.
1920 REM    SO A SPECIAL TIMER IS SET UP.....
1930 OUT O,01
1940 RETURN    'THIS MAY BE EXPANDED TO CONTROL MORE THAN ONE ALARM...
2000 REM DISARM ALARM...
2005 T=T+.03
2010 A9=0
2015 GOSUB 2100     GO TURN OFF ALARM TOO...
2020 RETURN
2100 REM TURN OFF ALARM
2105 T=T+.06
2110 L5=-1
2120 OUT O,02
2130 RETURN
2200 REM VIRTUAL LOAD PATTERN PP@
2205 T=T+.09
2210 L0=INT(R2)
2220 A=R2-INT(R2)*10
2230 GOSUB 6000
2240 RETURN
2250 REM TRIGGER ALARM AND LOAD PATTERN PP@
2260 GOSUB 1900
2270 GOSUB 2200
2280 T=T+.02
2290 RETURN
2300 REM REAL LOAD PATTERN PP
2305 T=T+.09
2310 L0=PP
2320 A=R3
2340 GOSUB 6500
2350 RETURN
2400 REM CLEAR KEYBOARD PATTERNS (COUNTERS ONLY!)
2410 REM  OPERATES FOR REAL KEYBOARD ONLY!!
2420 FOR D2=1 TO 5
2430 C1(D2)=1
2440 NEXT D2
2445 T=T+.3
2450 RETURN
3000 S=S*16
3005 T=T+.06
3500 IF L6>200 THEN 3530   'IGNORE IF LOG IS ALREADY FULL...
3510 L(L6)=S*1/D
3520 L6=L6+1
3525 PRINT "SWITCH TRIGGER..... NUMBER";S;" AT ";D;" SECONDS..."
3527 T=T+.09     ' THIS OFFSET MUST ACCOMODATE THE PRINT SPEED OF YOUR TERMINAL.
3530 RETURN
6000 REM PATTERN LOAD FOR VIRTUAL PATTERNS
6010 REM PATTERN # IS IN A, LOAD LIST # IS IN L0
6020 RESTORE 9000
6025 C(A)=0
6030 FOR B2=1 TO L0
6035 S(A)=0
6040 FOR B3=1 TO 10
6050 READ P(A,B3)
6055 T=T+.05
6055 IF P(A,B3)<>0 THEN S(A)=S(A)+1:T=T+.01
6060 NEXT B3
6070 NEXT B2
6075 READ A(A)
6080 RETURN
6500 REM PATTERN LOAD FOR REAL PATTERNS
6510 REM PATTERN IS IN A, LOAD LIST # IS IN L0
6520 REM WARNING: ACTION CODES FOR THE VIRTUAL KEYBOARD MAY HAVE
6530 REM A DIFFERENT MEANING FOR THE REAL KEYBOARD!!!
6540 RESTORE 9000
6545 C1(A)=0
6550 FOR B2=1 TO L0
6560 S1(A)=0
6570 FOR B3=1 TO 10
6580 READ P1(A,B3)
6585 T=T+.05
6590 IF P1(A,B3)<>0 THEN S1(A)=S1(A)+1:T=T+.01
6600 NEXT B3
6615 NEXT B2
6625 READ A1(A)
6635 RETURN
6900 REM ACTION BANKS ARE STORED IN DATA STATEMENTS AT LINE 7000
6910 REM FOR THE REAL KEYBD., AND AT 8000 FOR THE VIRTUAL KEYBD.
6920 REM THE COMMANDS WORK IN THE SAME WAY AS THE PATTERN-COMPLETION
6930 REM ACTION CODES WORK FOR THE REAL AND VIRTUAL KEYBOARDS.
6940 REM THE CODES ARE FOR WHICHEVER KEYBOARD IS LOADED. (I.E. IN
6950 REM CODES LOADED INTO THE VIRTUAL KEYBD. ACTION BANK WILL BE
6960 REM INTERPRETED LIKE VIRTUAL KEYBD. PATTERN-COMPLETION ACTION-CODES)
8900 REM THE PATTERN CODES FOLLOW... THEY MUST BE IN THE FOLLOWING FORMAT...
8910 REM
8920 REM DATA #,#,#,#,#,#,#,#,#,A
8930 REM
8940 REM WHERE THE FIRST 10 #'S ARE THE PATTERN SEQUENCE (USE ZEROES FOR
8950 REM THE REMAINDER OF THE STEPS IF A PATTERN IS LESS THAN 10 STEPS.)
8960 REM AND THE A IS THE PATTERN-COMPLETION ACTION-CODE FOR THAT PATTERN.
```

change the system set-up within NN seconds and hence not necessarily trigger the alarm.

3.NN— Disarm system after NN seconds.

4.NN — Turn off alarm after NN seconds.

5.NNPPQ — Load pattern number PP, taken from DATA statements into pattern P(Q,) after NN seconds.

6.NNPPQ — Trigger alarm after NN seconds and load pattern PP, as in 5.NNPPQ.

Each of the two keyboards has a separate bank of pattern variables. The bank for the real keyboard is P1(5,10), S1(5), C1(5), A1(5).

Before the patterns are checked, a special-action code is taken out of an array and loaded. There is one element of the array for each key on a keyboard, and there are two arrays, one for each keyboard — D(16) for the real key board; and D1(16) for the virtual keyboard. This action may be replaced by a pattern-completion action. If it's replaced, the situation becomes the same as if the special-action was never loaded.

Again, a given stimulus can cause a number of actions. For the virtual key board, the options are the same as for pattern matching. For the real keyboard they are:

0. — Do nothing.

1.NN — Trigger alarm after NN seconds.

2.NN — Arm alarm after NN seconds.

3.NN — Disarm alarm after NN seconds.

4.NN — Turn off alarm after NN seconds.

5.NN — Clear real keyboard pattern checkers.

6.NNPPQ — Load pattern number PP, taken from DATA statements into pattern P1(Q,) after NN seconds.

Some not-so-obvious features need to be discussed. There is only one running action register. Hence, if there is a specified delay before an action, such as triggering the alarm, is performed and another action is loaded, the triggering command is dropped irretrievably. This feature may sound like a disadvantage, but in fact it's not. For example, suppose the alarm is to be disarmed when sensors one, three and nine are triggered in that exact order. You might set up 1-3-9 in a pattern, with the pattern completion action being set to disarm the system. Also, the first of the three sensors' actions is set to trigger the alarm in 30 seconds. When an authorized person enters, he triggers sensor one, giving him 30 seconds to trigger sensor three. When sensor three is triggered, nothing happens. When sensor nine is triggered, nothing happens via the action variable D(9), but the pattern gets completed. Since the pattern checking routine is the last thing to have a chance to alter the action register, the alarm is disarmed by means of the pattern-completion action (A( )).

A few notes about patterns and sensors: First, a "do-nothing" command in the action register of either a pattern (A( )) or a sensor (D( )) will not affect the running action-command register. Also, a pattern of one step need not use up one of the precious few pattern registers, since all that need be done is to perform the desired action via the sensor action register. Finally, since pattern completion is checked after the sensor trigger action is loaded, the pattern checking holds priority over individual sensors. Thus, if a sensor both triggers the alarm and also completes a pattern which disarms the alarm (disarming also shuts off the siren), the alarm will be disarmed, not triggered. Although the sensor-trigger action says "set off the alarm", the pattern-completion action changes the register to "disarm the alarm" before the program gets around to actually triggering the alarm. Thus, the existence of only one action register can be used to great advantage.

Unfortunately, however, a potential problem shows up. What happens when a sensor stays triggered, as it is bound to do? With a "trigger after delay" command, the action register will be re-started repeatedly, and the alarm never goes off! For this reason, the computer keeps a "last state" register which buffers each sensor. When a sensor is triggered, it must be un-triggered before the computer will respond to another triggering. Also, a triggered sensor is "shut down" until either its action is completed or until a pattern completion (meaning one of the designated patterns) action is loaded.

Notice that the number of delay specifications in the program should be kept to a minimum. You should only set delays on the first members of a pattern or on a pattern completion action.

Finally, one last subtlety may not be obvious. Close examination of the program reveals that the patterns may actually be checked twice when a sensor is triggered. Suppose there was a pattern 2-6-9-3-2-4 with the pattern position pointer at the third element as shown:

Now suppose at this point, sensor two is triggered. The pattern matching sequence is broken, so the pointer is reset:

In this particular situation, if this pattern was only checked once, the pattern and its pointer would look like:

and the match of sensor two would be passed over. We should have checked twice, because if we had, the pattern and pointer would look like:

the way it should. Thus, in the program, if a pattern fails, then it is checked a second time after the pattern position pointer has been reset to the start of the pattern.

Note that the program is strictly modular in structure, with each block marked by a single REM statement. You can add to or delete from any block without changing other blocks, unless you modify the basic operation of the program.

Books

Here are a few of the useful books that Turkey found at the Library:

Bierman, Howard. *How to Plan and Install Electronic Burglar Alarms*. Hayden: Rochelle Park, N J . 1977.

Cunningham, John E. *Security Electronics*. Howard W. Sams: Indianapolis, 1970.

Cunningham, John E. *Building and Installing Electronic Intrusion Alarms*. Howard W. Sams: Indianapolis, 1973.

Mims, Forrest M. III. *Security For Your Home*. Radio Shack, 1974.

And here is a nifty book on interfacing:

Lesea, Austin and Rodney Zaks. *Microprocessor Interfacing Techniques*, 2nd ed. Sybex: Berkeley, CA, 1977.

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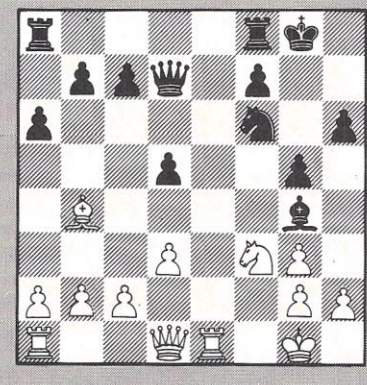
Rumbles from Roumania

. . . . When we last left this Balkan State chess conflict, it appeared that the newspaper readers (called "Cititorii" in Roumanian) were pummelling the computer. If, indeed, Felix had the proverbial nine lives, 3 or 4 of those lives had already been used up in the first dozen moves of the game. But fortunes of war, forever shifting in the annals of world history, seem to have shifted now in favor of Felix. The "cat" has turned a complete somersault in the air and with long sharp claws has begun to attack his attackers. The animal instinct for survival beats strongly in Felix's chest. He now (see fig.) has a Bishop pointed toward White Queen's delicate throat while his own Queen plus a Knight are standing strongly behind the Bishop. Felix is beginning to purr happily as he smells his prey dawdling ever closer to his grasp. To analyze the game so far, U. Valureanu, chess editor for the Roumanian "Magazinul" weekly, asked Roumania's international grandmaster, Florin Gheorghiu, to comment on the progress. "The opening position at which they have arrived by move 10," observes Gheorghiu, "is unusual. It is a variant of the Spanish opening. In a difficult game I once played with Bobby Fischer I also used the Spanish opening 1. . . . . .e5. But when Bobby played 2. N-f3 I responded with 2. . . . N-c6. At the third move, after Bobby played B-b5 I responded in the same manner as Felix, 3. . . . . .a7-a6. White, in the beginning has played passive chess. I believe that the majority of readers have not always come up with the best possible moves - that is, moves that a master would have made. As a result, I believe, the Cititorii don't hold on to a concrete advantage when they achieve one. The major defect in White's position consists in a situation in which they have foolishly enclosed themselves with a Bishop at b3. Also, the Pawn at d3 doesn't permit the Cititorii to immediately take advantage of Black's classic mistake in his variant. The computer, by the way, up to this point (move 10) hasn't done much better than White. I have been asked to say how I would have played the last few moves if I were the computer. But I'm not able to say what I would have played in place of Felix's moves because I would never be in this position. Personally, I've never played a game against a computer. I hope, someday, to play against Astro 64 (on Felix 256) which has been written by my friend Viorel Darie. Incidentally, I have seen a few good games played by the computer against the great West German Master, Hubner and against the English master Levy (a blitz game won by the computer.)" The moves of the game up to Black's 17th move are now:

White-*Roumanian Reader*
Black-*Felix 256*



Position after Black's 17th move.

1. e2-e4	e7-e5
2. Ngl-f3	Nb8-C6
3. Bfl-b5	a7-a6
4. Bb5-a4	b7-b5
5. Ba4-b3	Ng8-f6
6. 0-0	Nf6 x e4
7. Rfl-el	d7-d5
8. d2-d3	Ne4-f6
9. Nf3xe5	Nc6xe5
10. RxN+	B-e6
11. B-g5	Bf8-d6
12. R-el	0-0
13. N-d2	h7-h6
14. B-h4	g7-g5
15. B-g3	BxB
16. PfxB	B-g4
17. N-f3	Q-d7

What, now, are *your* next four moves including the computer's likely response? Send them to us. We will compile them, publish them here and send the results on to Bucharest so that the readers here can see how smart we American Cititorii are (we think):

White-*You the Readers*
Black-*Felix 256*

18.	. . . . .
19.	. . . . .
20.	. . . . .
21.	. . . . .

The making of Sargon

(Is chess a game that can be properly programmed only into a giant computer? Are the small computers destined to be forever limited to feeble attempts in this activity? Is the memory available with microcomputers far too small to accomodate the lengthy searches required in chess? The answers to all these questions is an emphatic no! That is the opinion of Kathey and Dan Spracklen who proved otherwise, last year, when they programmed a microcomputer to play chess, entered it into a San Jose tournament against other microcomputers and came away not only with first place, but with a new respect for microcomputers and their capabilities not previously accorded them. We asked Kathe Spracklen to recount her experiences with her chess program. The following letter, recently received from her, should serve as an inspiration and stimulus to other microcomputerists who are considering chess as an activity for their computers.)

. . . . . .Our interest in chess was caught by a short listing containing the beginnings of a chess program in BASIC. Because we were both chess players ourselves, the idea of programming a computer to play chess had instant appeal. At first, progress was rapid. We began by working out the data structures to describe the board and pieces, then the algorithms to generate legal moves. Each algorithm was expressed in an assembly-language level pseudo-code. We used the pseudo-code, since we had no idea at the time what machine we would finally use to implement the program. Chess, like life, has a lot of exceptions; every piece captures in the same way as it moves, except the pawn; the king can only move one square at a time in any direction, except for castling; and so on.

One of the knottiest problems was the pruning scheme to be used in whittling down alternatives in move selection. Any one who has stopped to calculate the escalating number of alternatives in a look-ahead procedure knows how quickly the tree widens. Our first attempt at the problem was to use forward pruning, a method that selects the best half dozen or so moves and expands only on those. If we had done any reading at all in the literature at that point, we would have discovered how poor was that choice. Our idea at that time was to do our best with our own ideas. We didn't want our thinking to be limited by what others had done before. The result was that we wasted a lot of effort devising tree handling algorithms. The work on forward pruning was nicely finished when a friend gave us a stack of articles on computer representations of chess and checkers. Included was an article by A.L. Samuel entitled "Some Studies in Machine Learning Using the Game of Checkers," (*IBM Journal,* November, 1967). Samuel's article described techniques of alpha-beta pruning. We were immediately impressed with its utility, and, subsequently, scrapped the entire forward pruning scheme. Other articles proved valueless to us as we blithely resumed our hermit-like approach to the SARGON program.

By November most of the pseudocode was written for the basic routines. We were anxious to try it out on a machine. It was time to look into the purchase of a micro-computer. Dan handled the preliminary selection of an appropriate chip. He spent hours pouring over instruction sets of the various micro-processors looking for features that would aid the implementation of our design. We finally settled on the Z-80 because of its bit manipulation capability. Then came the search for a machine. We decided not to get a kit. We were too impatient. After much shopping around, we decided on the Wave-Mate Jupiter III. Its higher price tag meant that we couldn't get much in the way of peripherals; but the features of hardware breakpoints and trace meant smooth debugging.

Those few weeks between ordering and arrival were filled with feverish activity. We had obtained a xerox of the assembly language manual at the time we ordered the Jupiter. Now we spent our time translating the routines into TDL Z-8Ø assembly code. Finally, on December 10, the new computer arrived. We accorded it all the pomp and ceremony usually reserved for the arrival of a new baby. In the coding chaos we forgot to get a table for the machine, so the computer took over the kitchen. It stayed there for a while, because Dan had to go out of town on business for two weeks. Left alone with the machine, I decided to investigate its graphics capability and ended up designing a chess board display for SARGON.

The busiest time of all spent on SARGON was the first three weeks of January. Dan was on vacation, and I was on semester break, so we both had lots of time to devote to SARGON.

Latest news to emerge from the computer-chess world is the announcement by Chafitz Company that David Slate and Larry Atkins have joined its organization as programmers. These two engineers are the chief programmers of the world-champion Chess 4.7, which this past August achieved a great victory by defeating an international master at a regularly scheduled tournament-style chess game. Although the computer lost the 5-game match to Levy, (conclusion of a bet made 10 years ago) – winning this one game (and drawing another) was a great achievement. If David and Larry are able to apply any of their expertise to Chafitz, Boris is sure to become the world's champion dedicated chess machine. It might also turn around and beat Chess 4.7 at its own game. An exciting development, observes one of the local chess masters.

Dan was determined to have the program running before he went back to work, and I was hard at work on the user interface and graphics display routines. We divided the computer time into shifts. Between us we worked around the clock. Dan met his goal. The program ran. But it played miserably. It opened with 1.N-QB3 and followed that brilliancy with 2.R-N1. We ended the "vacation" exhausted and disheartened.

Several more weeks of debugging occurred before SARGON played respectable chess. We compromised on our original plan to exclude canned opening variations and adopted a one move opening book. SARGON then played a sensible 1.P-K4 or 1.P-Q4, choosing at random between the two. As black, SARGON replied to any opening move with 1. . . . P-K4 or 1. . . . P-Q4 whichever was most appropriate.

During this time SARGON acquired its name. We had space for a six letter name at the top of the move list which the program prints on the video screen. Because the computer was a Jupiter, we thought it would be nice to name the program after one of its moons. There weren't any suitable names there. We did notice a moon around Saturn that we liked, Oberon. So Oberon it was for a few days until we discovered that Saturn's moon got its name from medieval folklore. Oberon was king of the fairies. The king part was nice, but . . . About that time Dan suggested SARGON. The name once belonged to an ancient Mesopotamian king, and it sounded strong. So SARGON it was. We later learned that Sargon is also a character from an episode of Star Trek.

Saturday, February 25, we received a notice in the mail announcing a chess tournament at the Second West Coast Faire. I don't know who got our name, or how they got it, but the bulletin was tantalizing:

"THERE IS STILL ROOM FOR MORE CONTESTANTS"

We debated all week end about entering. Dan was hesitant. It's a long drive to San Jose. He'd have to take time off from work, and the Faire was less than a week away. Was SARGON fully debugged? Did we stand a chance? I wanted to enter the minute I heard of the Faire. We could at least find out where we stood in relationship to other micro-computer chess programs. Monday I called Larry Wagener, the tournament director, and told him we were thinking of entering. On Tuesday we decided to go.

(Next month Kathe relates the strange series of events that awaited them at the San Jose Microcomputer tournament. A documented description and source listing of the program, in book form, is available now for $15. It can be obtained from Dan and Kathe Spracklen, 10832 Macouba Pl., San Diego, CA 92124.)

Stockholm exhibition

. . . . . In the 1974 World's First Computer Chess Championships, held in Stockholm, Russia's *KAISSA* won the tournament and claimed the title until Aug. of 1977 when it lost to U.S.'s *Chess 4.6*. There were about a dozen participants in that 1974 tournament including *Chess 4.0* (early version of *4.6*). The two teams, *KAISSA* and *CHESS 4.0* had failed to encounter each other during the regular 4-game matches. Afterward, however, because *Chess 4.0* was considered one of the strongest challengers at the tournament, a friendly, exhibition match was arranged between the two. The 65-game move that resulted is listed below with in-depth annotations by Gregory Judice of 740 Hemlock Drive, Oradell, NJ 07649. The annotations illustrate the way the computers were thinking, within their electronic networks, during consideration of each move. Also included here are separate annotations by Professor I.J. Good, of Virginia Polytechnic Institute and State University made at the termination of that 1974 game. The annotations by Prof. Good, of this first meeting between the world's two leading computer chess programs, are indicated by alphabetical references.

White - *Chess* 4.0 Black - *Kassa*

1 P-K4 P-Q4 2 PxP N-KB3 3 P-Q4 NxP 4 N-KB3 P-KN3

Preparing to fianchetto the Bishop.

5 B-K2

Prevents Knight pin and prepares for castling.

5 . . . B-N2

Increasing influence in the center.

6 O-O O-O 7 R-K

Indirect influence in the center.

7 . . . B-B4

Black's Bishops rake the center.

8 N-R4

Goes after Bishop.

8 . . . P-K4

Seems logical, because Black's threatened Bishop is protected; the Pawn move provides central strength as well as uncovering the Queen attack on the unprotected King's Knight.

9 NxB PxN

It's hard to say who has the better exchange. Will Black's strength in the center be enough compensation for his poor Pawn structure?

10 PxP N-N5

Note White's weakness on QB2. If Queen is gone, Black's Knight can take Pawn and fork White's Rooks.

11 QxQ(a)RxQ 12 B-KN5

Develops Bishop and if 12 NxBP 13 BxR NxR 14 BxP in other words, touche'.

12 . . . R-Q2 13 N-R3

Defends Pawn.

13 . . . BxP

Threatens the QN Pawn.

14 P-QB3

Stops the Bishop and challenges the Knight.

14 . . . KN-B3

Chooses not to fork Rooks.

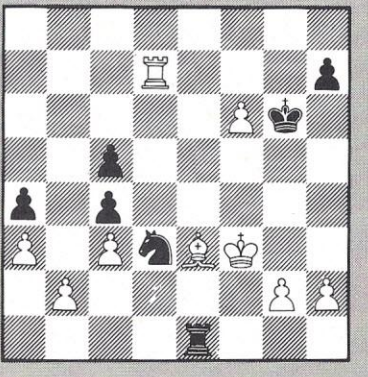
15 N-B4

Attack #1 on Bishop.

15 . . . P-QR4 16 B-B3

Attack #2 on Bishop.

Position after Black's 38th move. At this point it appears that *Chess 4.0* has an advantage in piece count. *Kaissa*, however, puts up a good battle.



16 . . . P-B3

Defends and attacks.

17 B-R6

Finds a better post for Bishop, restricts King's movement.

17 . . . P-R5 18 QR-Q RxR 19 RxR K-R(b)

The bloodshed isn't over yet!

20 BxN NxB

Better than Pawn take, develops Knight and allows Rook to defend back rank.

21 P-B4

Blocks doubled Pawns and challenges Bishop for control of center square E5.

21 . . . P-N4

Touche'.

22 PxB PxN

White forces Black to double Pawns again.

23 PxP R-Q

White goes up a Pawn.

24 R-KB

Can Black defend all his hanging Pawns?

24 . . . K-N

Maybe to provide defense against White's passed Pawn.

25 RxP

The Pawn is definitely a threat now.

25 . . . R-Q8+

Good offensive "D."

26 K-B2 N-Q

Now that's defense.

27 B-B4(c)

Another jab at Black's soft underbelly.

27 . . . P-B3 28 K-B3(d)

White controls the center while Black concentrates his offense on the Queen side with his Rook and passed Pawns.

28 . . . R-B8+ 29 K-K4

Strands the Pawn in favor of center control.

29 . . . R-QR8

Maybe trying for a promotion.

30 P-QR3 R-K8+ 31 B-K3

Once again White reaffirms his decision to stay in control of the center.

31 . . . R-K7 32 R-B2

The Pawn attack is thwarted nicely. It almost seems that White's last four moves were in preparation for Black's last move.

32 . . . R-K8 33 R-Q2 N-K3

Develops Knight towards center.

34 R-Q6

Double attack.

34 . . . N-B4+

Brings Knight into the offense. White Bishop can't take Knight.

35 K-B3

Now it can.

35 . . . N-Q6

Finds an effective post and attacks Pawn.

36 B-Q4

Closes Knight check on center square, adds additional protection on passed Pawn.

36 . . . P-B4

Black's last move allows protection for this move, and closes down the White Bishop's forward flight square.

37 B-K3 K-B2

Blocks Pawn.

38 R-Q7+(e)K-N3

King refuses to leave the defense of the King side and go down another Pawn. Also stays close to the White's passed Pawn.

39 R-N7+

Instead of concentrating strategy on promoting the Bishop Pawn, White seems to favor clearing the way for the other two Kingside Pawns.

39 . . . KxP 40 RxP(f)N-K4+41 K-B4

Seems both algorithms weigh center control heavily.

41 . . . N-Q6+ 42 K-K4 NxP

Both sides have a challenging job in promotion.

43 P-N4 N-Q8

Threatens to win Bishop.

44 P-N5+

This try for promotion has no Pawn to get past, thanks to his 40th move.

44 . . . K-N3

Gives no quarter.

45 R-R6+ K-N2

Forced off.

46 K-Q5

In order to protect Bishop, the Rook would be needed. It would seem Chess 4.0 values a single Bishop in the end game less than the possibility of Pawn promotion.

46 . . . RxB 47 KxP4 RxP+

Since Black's 39th move, Kaissa has outscored White in material exchange 6-2.

48 K-N5

Keeps Black from another "free" Pawn.

48 . . . RxP 49 P-R4 R-R6

Note that since Kaissa's Pawn structure is broken, neither can protect the other as White's can. Also, White's Rook will pay a price if it moves from its file.

50 KxBP N-N7(g)

Black's last chance to get reinforcements lies in the potential of the Pawn.

51 P-R5

Both Kings are open to attack and are actively being "used."

51 . . . P-R6

Rook is needed, but can he avoid paying the toll?

52 R-N6+ K-B2 53 R-B6+ K-N
54 R-N6+ K-B2 55 R-B6+ K-K2(h)

Doesn't seem to want a draw.

56 P-R6

White's Rook now has help defending the Rook Pawn and has eliminated Black's forward defense by locking the King out of the action. White also has provided himself with a one move defense against Black's Pawn Promotion.

56 . . . N-R5+ 57 K-N4

Maintains offensive pressure.

57 . . . P-R7

King would like to mount horse but in this position a strong defense is imperative.

58 R-B N-B6

Protect Knight and Pawn.

59 K-N3

Attacks both Pawn and Knight but the indirect Rook attack could give Black an extra tempo.

59 . . . P-R8/Q 60 RxQ N-K5 dis.ch

Here's the extra tempo. Instead of coming to the defense of the Pawn with the Rook, White must waste a move to get out of check.

61 K-B4 NxP 62 R-R6

Can Chess 4.0 hold the Pawn?

62 . . . N-B2

Double attack on Pawn.

63 R-R7+

Desperation.

63 . . . K-K3 64 R-R6+ K-B4

Black hastens to attack the Pawn.

65 K-Q4

White gives up on the Pawn.

65 . . . NxP

Extremely difficult mate, if not impossible, considering the players.

DRAW

Supplementary Annotations by Prof. J. J. Good.

(a) Better might be P-KB4. It is difficult to see how Black could win his pawn back

(b) This move of Black's is hard to understand. Certainly it is difficult for Black to find a good move but K-B2 looks preferable, although it permits checks.

(c) Instead of White B-B4, better would be R-QR5. Then R-QN8; R-QR8, RXPch; K-K3--and wins.

(d) White 28 R-QR5 should have won.

(e) Perhaps better is B-N5, with the plan of checking with the Rook and forcing the pawn through. The advanced pawn is too valuable to be changed off--which is what happens in the game.

(f) Although White has 2 united passed pawns they are so backward that they might not be able to compare with the Black pawns after he cleans up on the Q side.

(g) If so. . .P-R6, 51 R-R6 draws; also 51 P-R5, RXP; 52 R-R6 (not 52 RXR?, P-R7).

(h) Black has recognized a repetition of position and has played a new move. Some computer programs would have allowed a draw by repetition.

CONCLUSION: Except for the one move Black 19. . .K-R1, the game as a whole has nothing to show that it wasn't played by people even in the end game. It could easily have been played at a level of 1700, or even at 1800. It might be unsporting but I am also inclined to say that Black was lucky to draw.

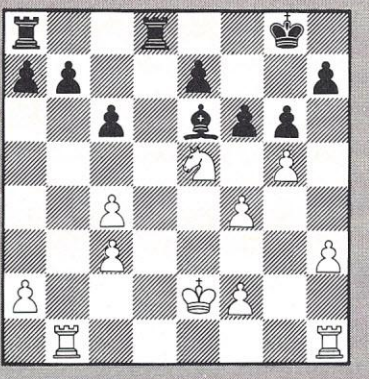
– I. J. Good

Endgame Problem no.1

John Roycroft of 17 New Way Road, London NW9 6PL, England, is editor and Publisher of "EG", the world's only magazine devoted exclusively to the endgame in chess. In a recent letter received from him, he writes: "Just as the human chessplayer should learn to handle a few pieces before handling many, surely the computer ought to do the same. In brief, begin with the endgame. How well can micros mate with king and rook, with king and queen, with two bishops, or with bishop and knight? How well can they play the endgames of queen against rook, rook against knight, rook against bishop? Then there is simply king and pawn against king. A convenient way to refer to these endgames uses the 'GBR' code. (After the initials of Richard Guy, Hugh Blandford and John Roycroft,

at various times endgame editors of the British Chess Magazine.) This code uses four digits.) The digit **place** (thousands, hundreds, tens and units) denotes the piece (queen, rook, bishop, knight). The digit **value** specifies the number of such pieces and color. It works by counting '1' for a white piece and '3' for a black piece. The 1's and 3's are summed. A four-digit code is called a **class**. Example: the GBR class 0100 represents no queens, one wR, no bishops, and no knights. The GBR class **1300** represents one wQ and one bR and no other pieces. Class 0011 is one wB and one wN. Class 4876 means wQ, bQ, wRR, bRR, bBB, wB, bNN. The best way to denote pawns is to add uncoded digits to the available decimal places with white preceding black. The GBR class of 0000.10 means one white pawn and no black pawns. The class 4000.10 would indicate wQ and wP against bQ. The advantage of starting with the endgame is that you know very soon how well you are programming. I have looked through the Toronto games and I am surprised that so many games managed to reach a recognizeable endgame! And some are decidely interesting." John Roycroft's book, "Test Tube Chess" is claimed to be the only comprehensive introduction to the chess endgame study in any language. The hard cover book contains 370 pages and 470 diagrams. It is available from Chess Life and Review for $14.95. The book may also be obtained directly from the author at $12.00 by writing to him at above London address.

White – *'66 '76* Black – *Elsa*



End Game Problem of *BS '66 '76* vs *Elsa*. From a game occurring at the Toronto Computer Chess Tournament. Black (*Elsa*) to move and win. Answer elsewhere in this section.

Solution to end game

21.	Bxc4+
22. K-e3	PxN
23. PxP	PxP
24. RxP	R-d3+
25. K-e2	R-e8+
26. R-37	RxR+
27. K-fl	R-g3 mate

This endgame occurred in the match between *BS '66 '76,* (playing White), and *Elsa* (playing Black). The endgame begins after White's 21st move. "Black heads directly for mate in the endgame," says John Roycroft. "Instead of trying to win more material like White's isolated pawn on a2."

Edinburgh endings

. . . . . Donald Michie, of the University of Edinburgh, England, reporting on a computer-chess conference held at Edinburgh U. earlier this year, described, among other subjects, the interest in certain end-game positions and the problems encountered. Prof. Michie's report, which appeared in the May 25 issue of Computer Weekly, follows:

THERE was plenty to interest both chess and computer people at the two-day event, Advances in Computer Chess, held at Endinburgh University.

One of the highlights was an exhibition match between Master, Britain's chess program, and Michael Clarke, director of the conference.

The match, sponsored by the Times, was commented on by US National Master Danny Kopec. Match director was International Master Harry Golombek.

Clarke's playing strength lies in the expert range, one level down from National Master. My own conclusions from the match was that if Master is ever to cause anxious moments for a human chess master (such as David Levy). then it will need extension of its present 5-7 ply lookahead to a solid 9 ply.

But the program, developed by John Birmingham and Peter Kent, is a considerable technical achievement, especially considering that it has been done as a spare time pursuit only.

The program ran on the Atomic Energy Research Establishment's IBM 370/168 at Harwell, and was accessed remotely from Edinburgh over the public telephone system.

A different clash between human and machine expertise took place during the computer chess exhibition, sponsored by Computer Weekly, An exhibit mounted by Tim Niblett, of Edinburgh, provided an interactive terminal connected to Ken Thompson's (of Bell Labs) database for the King-Rook-King-Knight ending.

Niblett had implemented it on the Edinburgh Digital Equipment DECsystem 10 in such a way that an end-game expert could play across the board against a machine-stored optimal strategy.

Until recently it was believed that there is not a great deal to be known about the King-Rook-King-Knight ending and that what there was could already be found in the books. Niblett and others have recently shown that these suppositions are spectacularly wide of the mark.

To drive the point home, such giants as Craig Pritchett, reigning champion of Scotland and Britain's No 1 end-game expert, John Roycroft, were given positions of the King and Rook vs King and Knight game, and invited to play the Rook side to victory against the database. The latter has some three million positions, with the Knight's side best defensive move entered against each.

Lured by intellectual curiosity rather than by the substantial money prizes offered, the chess masters tried repeatedly to win. But the prizes remained unclaimed.

The next research task, on which several of the conference papers had a bearing, is the use of the computer-de-

rived knowledge to rewrite the textbooks, so that chess masters of the future can stand on the shoulders of today's man-machine skills.

Contributions by Michael Clarke and Don Beal of Queen Mary College, London, emphasised this same theme; i.e. the refinement of existing book theory in respect to clarity, accuracy and completeness.

Clarke's paper, and a paper from Max Bremer, of the Open University, showed that even so humble a problem as King and Pawn vs King offers rich material for computer-aided theory building.

On a different note, John Moussouris of Massachusetts Institute of Technology, and Oxford, and Kevin Coplan, with a home-built chess machine, gave glimpses of a highly topical question. How should we blend parallel, special peripherals into integrated man-machine problem solvers?

Another overseas contributor, Jacques Pitrat, of Paris University, revealed new details of his program for finding deep tactical combinations. Outclassing as it does Grand Master skill at this narrow task, the program is at the very least a coup de theatre.

But it is much more, for this performance has only been achieved (some say could only be achieved) through a structure of goal formation and reasoned planning which closely parallels the tactical thinking of the chess master.

The man-machine which stole the show was Edinburgh Regional Computer Centre's display of its adaptation of the University's EMAS interactive software system for ICL's 2900 new range.

Three chess programs – strong, weak and beginner – were available, on seven terminals connected to the centre's ICL 2970. Until late at night the public queued for a turn at a terminal as the parallel battles raged.

Will there, I wonder, be chess on viewdata?

The conference, for which IBM had provided financial support, ended leaving an intriguing question in the air. Should there be a regular world championship for computer assisted chess? Would we then see works teams formed of mixed industrial and academic composition, as in the heroic era of motor racing?

Victory will go, as then, to those who can most creatively match new designs and instrumentation to the human's special skills and thus potentiate them.

Time will tell.

In corresponding with John Roycroft (who does occasional end-game analysis for PC) we asked him about that end-game challenge of Edinburgh. John's reply: "The article is only partially accurate. The system was on line (single terminal) for a total of five hours during the conference, so 'repeatedly' (the word Michie uses) is misleading. In addition, and with no warning, a total thinking-limit time of 15 minutes was imposed, five times faster than the rate of over-the-board tournament chess (because the longest solutions to the end game of Rook vs. Knight require 27 moves.) No wonder the money was unclaimed! This led to correspondence and a further challenge (actually called an invitation) which I accepted. A report on that will be forthcoming. However, the Rook-versus-Knight data base is very interesting and I'm glad to have played against it. Indeed I may do so again, though what I should like to do is to examine some of the lines of play in quantity, since their variety is (to judge from the lines I have seen) remarkably limited. Incidentally, getting back to that Edinburgh conference, having failed to solve the 27-move position in 15 minutes, I studied it overnight and then asked for it again. This was agreed, but (also agreed) not for the money. I won (it had been tough analyzing, I can tell you). Again, rather a contrast to my good friend Michie's 'tried repeatedly to win' clause. To do him justice, he's only reporting what the programmer-operator Tim Niblett, told him." (Subscriptions to "EG", the endgame magazine edited by John Roycroft, can be obtained by sending $10.00 to A.J. Roycroft, 17 New Way Road, London NW9 6PL, England. Subscription is for four issues per calendar year.)

Chess Chatter

. . .From May 30 to June 14, 1979, a group of American chess players, led by SHELBY LYMAN, will visit the Soviet Union on a unique tour – THE RUSSIAN GAMBIT – arranged by Citizen Exchange Corps and Co-sponsored by the U. S. C. F.

Participants will have an opportunity to meet Russians face-to-face across the chessobard in chess clubs, parks, factories, Friendship Houses, and Pioneer Palaces, in Moscow, Tbilisi, Sukhumi, and Leningrad. There will also be simultaneous chess exhibitions and discussions with noted chess personalities. *In addition, the group will visit Soviet computer chess centers and learn first hand about Soviet computer programs.*

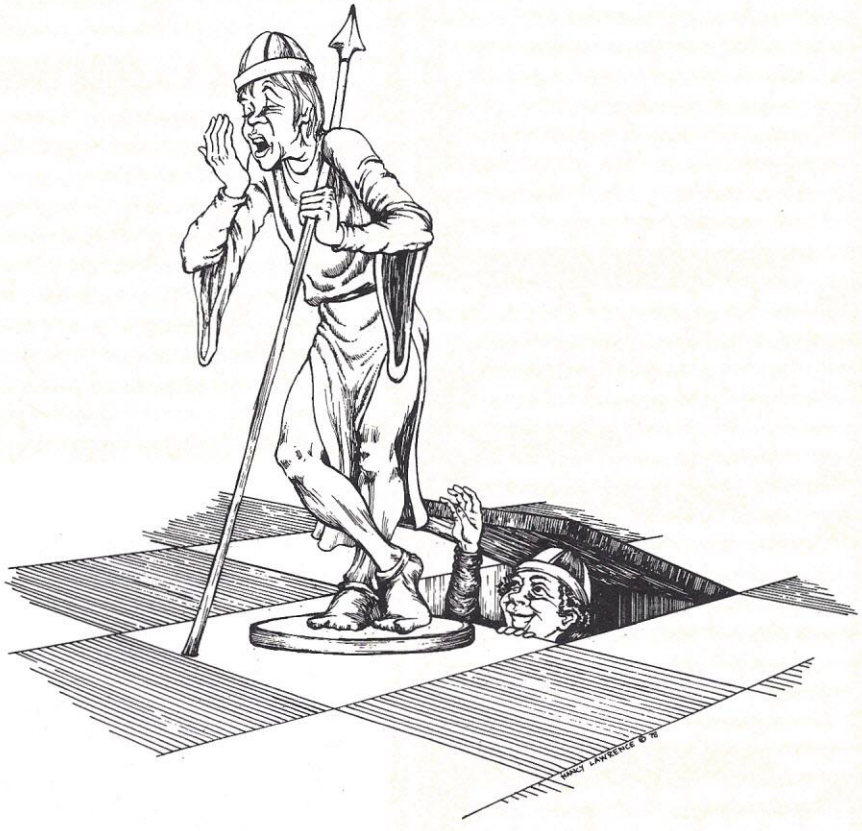
CITIZEN EXCHANGE CORPS is a non-profit, non-political organization which has been arranging intercultural visits to the Soviet Union since 1962, in an effort to promote greater understanding between individuals and nations. For more information on THE RUSSIAN GAMBIT, contact: CITIZEN EXCHANGE CORPS, 145 Hanover Street, Boston, MA 02108.

. . . .Winner of the first computer chess championship in Israel, which ran Aug 6-9, was *DUCHESS,* developed by Tom Truscott, Bruce Wright and Eric Jensen of Duke University. Tying for second place were *CHESS 4.6* of Northwestern and *CHAOS* of the University of Michigan. Games and comments will be upcoming in forthcoming issues. The final results were:

PROGRAMME	ROUND 1 Colour of Opponent	Score	ROUND 2 Colour of Opponent	Score	ROUND 3 Colour of Opponent	Score	FINAL SCORES Sc.	Place
1. *CHESS 4.6*	W 4	1	B2	0	W 6	1	2	=2
2. *DUCHESS*	B 5	1	W1	1	B 3	1	3	1
3. *CHAOS*	W 6	1	B 4	1	W 2	0	2	=2
4. *OSTRICH*	B 1	0	W 3	0	B 5	1	1	=4
5. *BS '66 '76*	W2	0	B 6	0	W 4	0	0	6
6. *TELL*	B3	0	W 5	1	B 1	0	1	=4

. . . . . David Levy's unresolved bet against a group of university professors that he would be able to beat any computer at chess in the course of a ten year period ended within that time limit (Aug 1978) and was a victory for Levy. The score of the five-game match (a scheduled sixth game not being necessary) was 3½ points to 1½ for chess 4.7. The computer beat Levy in one game (drawing another.) That win marked an historical event, because it was the first time a computer has beaten an international master in an official regularly scheduled tournament game. (Computer victories have been achieved in unofficial, exhibition matches.) The actual match games of the Toronto-based tournament will appear in future issues of PERSONAL COMPUTING. David Levy, 33, from London, is rumored to be considering another wager (five-year limit this time) in spite of an increasing belief among scientists that computers are steadily improving to the point where they will become unbeatable by any human. . . . . Earl Johnson, of Toronto, Ontario has sent along some interesting observations on computer chess. "Chess has certain characteristics which make it difficult to program," he writes. "Those are the problems of multi-plex tree branching routes and their probabilities; conditional indices of priority of threats and advantages; library functions for information retrieval; and timing devices for search procedures of particular positions. The ultimate achievement in chess, either cerebral or cybernetics, will have to come in: 1) Openings by depth of move (eliminates move simulations and errors); 2) Competence in tournaments versus human masters – a fallibility of biology; 3) Previous moves displayed and possibly printed out upon request which I call 'Navigator's Log Book'; and 4) Procedures for unlikely routes and positions – 'Hell of an emergency'. At the present time my computer chess is limited to revising the openings system via FIDE Encyclopedia of Chess Openings; writing of software program for mid-game and end-game procedures; reducing tabulations of library functions for machine and reference and devising procedural linkage to eliminate time of search. I would like to see the big-computer tournaments opened to amateurs in some fashion. Right now they are restricted to 'Institute Activity.' " . . . . . "Professionally, I'm at MIT, analyzing lunar laser ranging data, but I've been interested in computer chess for about 6 years," writes Roger Cappallo, of Lincoln, Mass. "I'm a class B player and a former systems programmer, but have not had the opportunity to write a program that does more than make legal moves (it was written in FORTRAN, and run in batch – a pain to work on and started using too much time.) I recently bought an Horizon I and as soon as I get an assembler, I plan to write a serious program. I have played against the Greenblatt program and Tech II (both of which can be crunched positionally) many times. On one occasion I got to play Baylor's program using *CHEOPS* the hardware box that generates the move tree. It incredibly searched 10 and 11 ply deep in a minor-piece endgame!! I drew." . . . . . John H Cone, of Pasedena, CA., has a suggestion for improving the big computers by matching them up against the small computers: "I think there is a minimum level of proficiency at which a computer chess program becomes of interest. A program which is grossly inferior to the average 7 or 8 year old player is not of interest to anyone but the programmer, who should be told, 'Keep trying. You may be on to something. Keep in touch.' But do not print the games. For example, I saw one game where the program took a Pawn instead of a Rook. This particular program was bad. It had no theoretical nor practical importance and was not even susceptible to any sort of rational analysis! In my opinion, it was pure garbage! What, then, is a reasonable level? The absolute minimum should be one that can beat Boris when Boris is set at 30 seconds. A reasonable minimum should beat Boris when Boris is set at 3 minutes and the computer at the same time-allowance. A fairly good program would beat Boris giving Boris a time advantage. A good program would beat an average C player or, occasionally, a B player.". .

. . . Doug Penrod began the Computer Chess Newsletter in Santa Barbara, CA. As resident expert on computer-chess programs he often receives advance copies of chess programs for test and evaluation. He recently received a copy of a new program that Atari planned to release early in 1979. This program was given to Russ McNeil at the same



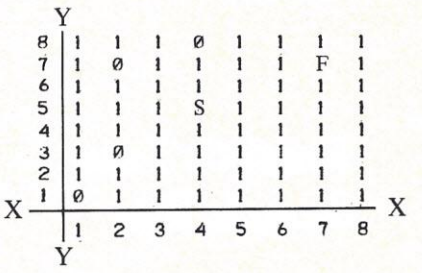
time that Don Gerue was adapting Microchess to his Heath H8. The two got together and decided to match the programs against each other and also against a Chess Challenger model belonging to Russ. This turned out to be an interesting experiment, according to reports from Don and Russ. Some new questions and possibilities were raised. For one thing, in the San Jose Microcomputer Tournament, Microchess was defeated by Chess Challenger Level 3. But at Santa Barbara, when the colors were reversed, Challenger was defeated by Microchess. It was evident that the Atari program was much stronger than either the current Chess Challenger or Microchess 1.0. But would this still be true when compared with Microchess 1.5 or Chess Challenger Level 10? With these questions in mind, the idea of the Micro-Masters Tournament was conceived by the two experimenters. Why not bring together available programs and test them in an environment of double round-robin? Don and Russ decided to run these matches during evenings, or week-ends and at a leisurely pace. All exhaustive tournament pressures would be eliminated. Various manufacturers were contacted and eight contestants were entered. The Micro Masters tournament then began on Sept. 6 and was scheduled to run through November. The contestants were listed as:

Microchess 1.0	Sold in object code form for 8080 computers.
Microchess 1.5	Available in casette for the TRS-80
Microchess 2.0	New. In casette form for Pet and Apple computers.
Chess Challenger-3	Dedicated processor.
Chess Challenger-10	New. Improved model.
Boris	Dedicated processor. Recently upgraded.
Atari	New. A standard game casette for the Atari Video Computer System (TV Video Game Processor.)
Sargon	The 1978 San Jose champ. Now also available in casette for the TRS-80.

(Results, standings and games will be reported here in upcoming issues.)

Knight's Tour

. . . Dan Clarke, 105 Fir Ct. Fredericton, N.B. Canada E3A 2E9 has sent along a BASIC program on the KNIGHT's TOUR PROBLEM. "Not a sophisticated problem," writes Dan. "But it does simulate the Knight's Tour Problem nicely. The program even managed to give me one solution of 60 moves which I consider to be excellent. You may be interested to know that there is at least one solution to a 64-move tour by the Knight if the proper starting point is chosen. The problem of course, is to have the Knight visit each of the 64 squares without landing on any square more than once. Such a series of moves is called the Knight's Tour. I have never seen a solution to this problem nor have I seen a computer program's listing of the solution. In this probelm the board is divided into two axes, 'x' and 'y' and numbered, on each axis, from 1 to 8. Thus a move of X5Y3 to X4Y5 would be a knight moving from K3 to Q5." The program follows.



The chessboard laid out on an x-y axis. "S"= start. "F"=finish. ϕ = squares not touched.

```
110 DIM B(11,11),S(10)
111 DIM X1(64),Y1(64)
116 PRINT
120 REM   /SET CONTROL PARAMETERS/
122 INPUT "START TOUR COUNT";W
158 REM   /CHOOZE STARTING POINT/
160 X=INT(RND(1)*10)
170 IF X>8 THEN 160
172 IF X<1 THEN 160
180 Y=INT(RND(1)*10)
190 IF Y>8 THEN 180
192 IF Y<1 THEN 180
194 B(X,Y)=1
195 M=1
196 X1(M)=X:Y1(M)=Y
210 REM   /DETERMINE
    IF VALID MOVE POSSIBLE/
211 FOR K=1 TO 8
212 S(K)=1
213 NEXT K
220 IF X+1<9 THEN 230
222 S(1)=0:S(2)=0
230 IF X+2<9 THEN 240
232 S(3)=0:S(4)=0
240 IF X-1>0 THEN 250
242 S(5)=0:S(6)=0
250 IF X-2>0 THEN 258
252 S(7)=0:S(8)=0
258 IF B(X+1,Y+2)=1 THEN S(1)=0
262 IF B(X+2,Y+1)=1 THEN S(3)=0
264 IF B(X+2,Y-1)=1 THEN S(4)=0
265 IF B(X-1,Y+2)=1 THEN S(5)=0
266 IF Y=1 THEN 269
267 IF B(X+1,Y-2)=1 THEN S(2)=0
268 IF B(X-1,Y-2)=1 THEN S(6)=0
269 IF X=1 THEN 276
270 IF B(X-2,Y+1)=1 THEN S(7)=0
272 IF B(X-2,Y-1)=1 THEN S(8)=0
276 IF Y+1<9 THEN 282
278 S(3)=0:S(7)=0
282 IF Y+2<9 THEN 288
284 S(1)=0:S(5)=0
288 IF Y-1>0 THEN 294
290 S(4)=0:S(8)=0
294 IF Y-2>0 THEN 300
296 S(2)=0:S(6)=0
300 V=0
305 FOR K=1TO8
310 V=V+S(K)
320 NEXT K
340 REM   /IF SINGLE MOVE
    POSSIBLE THEN MOVE/
```

```
350 IF V=0 THEN 605
360 IF V>1 THEN 510
370 FOR K=1TO8
380 IF S(K)=0 THEN 394
390 M=M+1
392 GOSUB 815
393 GOTO 211
394 NEXT K
395 GOTO 211
500 REM   /IF SEVERAL MOVES POSSIBLE
    THEN CHOOZE MOVE RANDOMLY/
510 K=INT(RND(1)*10)
520 IF K>8 THEN 510
521 IF K<1 THEN 510
530 IF S(K)=0 THEN 510
535 M=M+1
540 GOSUB 815
560 GOTO 211
604 REM   /CHECK IF TOUR RECORD
    AND PRINT/
605 IF M<=W THEN 710
606 W=M
619 PRINT
620 PRINT "KNIGHT'S TOUR"
621 PRINT "-------------"
622 PRINT
625 PRINT "MOVE  X  Y"
626 PRINT
640 FOR K=1TOM
645 IF K>9 THEN 660
646 PRINT " ";K;" ";X1(K);Y1(K)
647 GOTO 670
660 PRINT K;" ";X1(K);Y1(K)
670 NEXT K
674 PRINT
675 FOR A=8TO1STEP-1
676 PRINT B(1,A);B(2,A);B(3,A);B(4,A);B(5,
    A);B(6,A);B(7,A);B(8,A)
677 NEXT A
700 REM   /INITIALIZE BEFORE RETURN/
710 FOR X=1TO8
711 FOR Y=1TO8
712 B(X,Y)=0
713 NEXT Y
714 NEXT X
715 GOTO 160
800 REM   /SUBROUTINE TO MAKE MOVE/
815 ON K GOTO 820,842,848,854,
    860,866,872,878
820 X=X+1:Y=Y+2
840 GOTO 882
842 X=X+1:Y=Y-2
846 GOTO 882
848 X=X+2:Y=Y+1
852 GOTO 882
854 X=X+2:Y=Y-1
858 GOTO 882
860 X=X-1:Y=Y+2
864 GOTO 882
866 X=X-1:Y=Y-2
870 GOTO 882
872 X=X-2:Y=Y+1
876 GOTO 882
878 X=X-2:Y=Y-1
882 X1(M)=X:Y1(M)=Y
886 B(X,Y)=1
888 RETURN
999 END
```

Squares touched in 60-move Knight's Tour as solved by program:

1	1	1	0	1	1	1	1
1	0	1	1	1	1	1	1
1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1
1	0	1	1	1	1	1	1
1	1	1	1	1	1	1	1
0	1	1	1	1	1	1	1

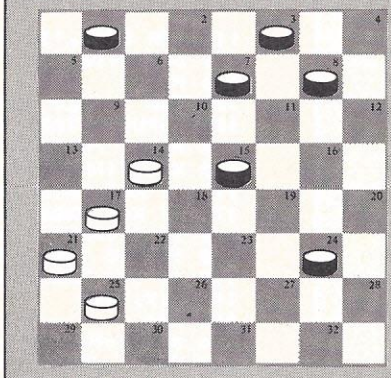
Knight's Tour Sample Run

MOVE	X	Y	MOVE	X	Y
1	4	5	31	3	4
2	6	6	32	5	3
3	8	5	33	7	4
4	6	4	34	8	2
5	7	6	35	6	1
6	8	8	36	4	2
7	6	7	37	2	1
8	7	5	38	1	3
9	8	7	39	2	5
10	6	8	40	1	7
11	5	6	41	3	8
12	3	5	42	4	6
13	4	7	43	5	4
14	2	8	44	7	3
15	1	6	45	8	1
16	2	4	46	6	2
17	4	3	47	8	3
18	5	5	48	7	1
19	6	3	49	5	2
20	8	4	50	3	1
21	7	2	51	1	2
22	5	1	52	3	3
23	3	2	53	4	1
24	4	4	54	2	2
25	6	5	55	1	4
26	8	6	56	2	6
27	7	8	57	1	8
28	5	7	58	3	7
29	3	6	59	5	8
30	1	5	60	7	7

Computer Checkers

. . . . . In 1977, Elbert Lowder, of Sanford, NC, one of the world's top-ranked checker players, took on the then newly conceived Duke University checker program. The Duke checker program was developed in 1975 by Eric Jensen, a former student at Duke and currently a member of the staff of the Graduate School of Business Administration. Last year he was joined in his effort by Tom Truscott, a graduate student in the Department of Computer Science. Mr. Truscott has gained international recognition with his *Duchess* Chess Playing Program which this year, in Jerusalem, defeated the world's computer chess Champion, *CHESS 4.6.* The Duke Checker program named *PAASLOW,* was placed in contention against checker-whiz Lowder. At the beginning of the match, Lowder expressed a low opinion of previous computer vs. computer games which had been played at the rate of 25 seconds per move. Duke's games against him, however, were increased to 80 seconds per move and Lowder conceded that the machine was, indeed, a serious contender. Tom Truscott, commenting recently on the Duke program, said: "In computer checkers, as in many areas of artificial intelligence, misconceptions abound as to the present capabilities of machines. The Duke

Game between Duke Computer's checker program and Elbert Lowder. Position after White's 15th move. Black to move and win.



University checker program, is probably the strongest non-human checker player today, yet it is by no means unbeatable. (Some authors have already claimed this erroneous distinction for computers) Also, the program is not limited to Class 'B' players. When the Duke program was adjusted to average 10 to 20 seconds of computation time per move, it achieved a slightly positive score (2 wins, 1 loss, 1 draw) against Tim Laverty, rated the 75th strongest player in the United States. In another test, it was set to average four times as long per move and was able to achieve a slightly negative score (1,2,2) against Elbert Lowder, the national 'Go As You Please' champion." One of those games follows.

Black- *ELBERT LOWDER*
White- *PAASLOW (Duke Computer).*

(Black to move first)

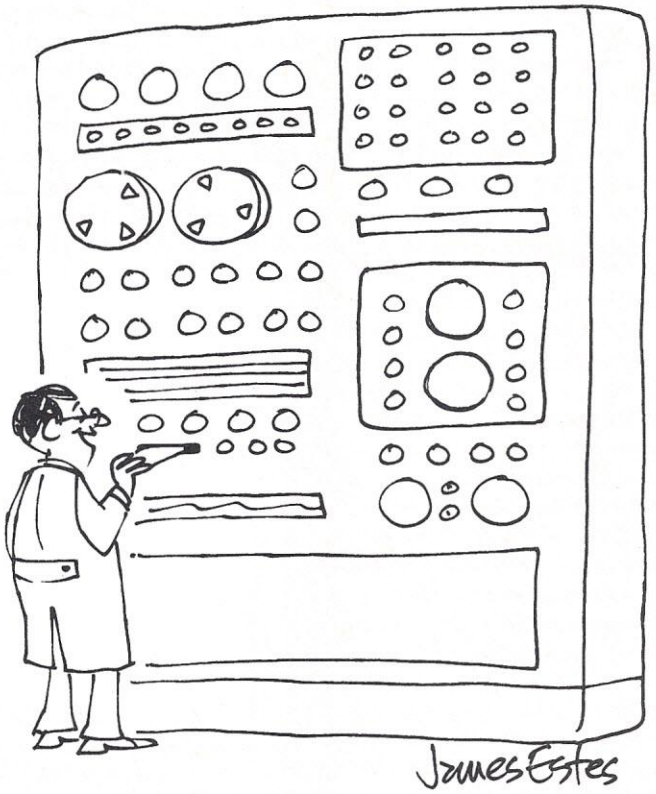
Black	White
1. 10-15	21-17
2. 7-10	17-13(A)
3. 3-7	23-19(B)
4. 11-16	25-21
5. 16-23	26-19
6. 7-11	31-26(C)
7. 11-16	29-25(D)
8. 16-23	27-11
9. 8-15	24-19
10. 15-24	28-19
11. 4-8(E)	26-23
12. 8-11	30-26
13. 11-16	22-18
14. 10-14	26-22
15. 16-20	32-28(F)
16. 20-24	19-15
17. 24-27	22-17
18. 27-31	17-10
19. 31-26	23-19
20. 26-23	10-7
21. 23-14	7-3
22. 14-18	15-11
23. 18-23	19-15
24. 9-14	11-8
25. 6-9	13-6
26. 1-19	25-22
27. 19-24	28-19
28. 23-16	8-4
29. 16-19	4-8
30. 14-18	22-15
31. 19-10	

Lowder Wins

Annotations byR.L. Fortman, Games Editor of American Checker Federation:

A) This permits equality. A more agressive attack would be 17-14.
B) Allows a favorable Black formation known as the 'Alma' opening. An alternate move of 24-20 would be slightly better, but the first side is even.
C) A bad move that other computer programs also seem to favor. A better direction is 29-25 or 22-17 leading to a draw with standard variations.
D) If White had moved 27-23 then the responses of 9-14, 29-25 and 15-18, 22-15, 14-17 etc. leads to a Black win.
E) Black has the vital center control and a solid double center. The White position soon collapses.
F) A move of 32-27 to stop the piece is hopeless as Black counters with 2-7. The text lets in the powerful Black king; soon to play havoc with the White defense.

Chess Program Part VIII of Mike Valenti's dissertation on how to write a computer chess program will appear in the next issue.



"DO A GOOD JOB ON THIS PROBLEM AND I'LL LET YOU WORK SOME CROSSWORD PUZZLES."

WHAT'S COMING UP

SYSTEMS

3PX640 Central Processing Station

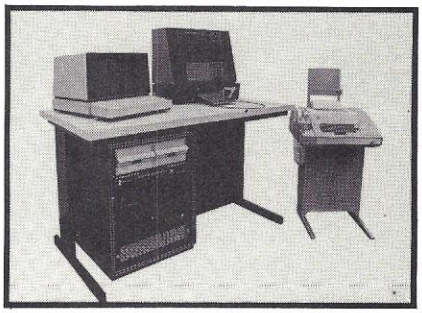
Three Phoenix Test, Inc. has announced the 3PX640 Central Programming Station, featuring proven software for Test Program Generation and 8-port data link communication to remote logic circuit test stations.

The 3PX640 is a total system, allowing computer and electronic manufacturers to generate highly effective logic circuit test programs, while concurrently executing program call-up requests from an unlimited number of remote logic board test stations.

According to Tom Connors, V.P. Marketing, the 3PX640 provides the user with a microprocessor based central programming system, up to eight data link ports for program transfer to remote logic board test stations, and perhaps most important, total field proven software for test program generation. The 3PX640 is designed for use with Three Phoenix Test 3PX540 Logic Board Testers in remote terminal applications. It should be noted that FLASH test programs, as generated on other Three Phoenix Test systems, will execute identically on the 3PX640.

The 3PX640's program interrupt system allows test programs to be generated while concurrently servicing program call-up requests from remote test stations. Data link communication at any rate up to 9600 baud is permissible, for the 3PX640 automatically adjusts to the incoming baud rate for subsequent program transfer. Remote data link capability is an important concept in test programming allowing central program generation and distribution to a large number of remote test stations throughout the plant, city or even the world. This capability allows other facilities as well as field service or depot maintenance centers to have up-to-date, highly comprehensive logic board test capability at their fingertips.

The 3PX640 is provided complete with console, ASR-33 teletypewriter, disk storage and line printer and is



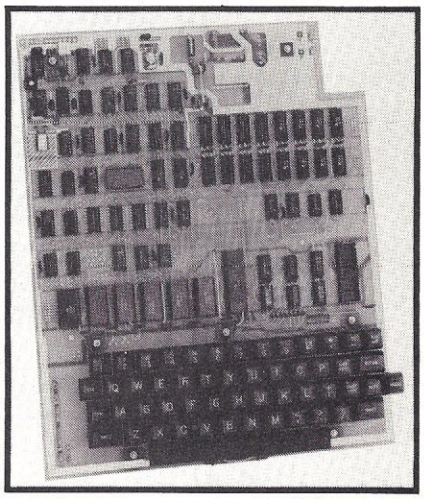
modestly priced. Various options are available, allowing each system to be tailored to the individual user needs.

For further information contact Tom Connors, Three Phoenix Test, Inc., 10632 North 21st Ave., Phoenix, AZ 85029; (602) 944-2221. *Circle No. 137.*

Personal Computer System with Dramatic Price Performance Breakthrough

Ohio Scientific, Inc., has just introduced Superboard II, a complete personal computer system contained entirely on only one board. Superboard II was designed specifically with low price and the first-time user in mind.

Superboard II's single-board construction and custom LSI micro circuits result in large cost savings without sacrificing system capabilities or



performance. Superboard II features include 8K of BASIC-in-ROM, up to 8K of static RAM, an ultra-fast 6502 microprocessor, a full 53-key computer keyboard with upper/lower case and user programmability, a video display interface with graphics, and a Kansas City standard audio cassette interface, plus full machine code monitor and I/O utilities in ROM. The BASIC-in-ROM is full-feature BASIC that runs faster than currently available personal computers and all 8080-based business computers. The video display is direct access with 1K of dedicated memory in addition to user memory. This display has upper case, lower case, graphics, and gaming characters for an effective screen resolution of up to 256 X 256 points. Normal TV's with overscan display about 24 rows of 24 characters; without overscan up to 30 X 30 characters.

Available options include an expander board that features 24K of additional static RAM a dual mini-floppy interface port adapter for printer and modem, and an Ohio Scientific 48 line expansion interface. Also available is an assembler/editor and extended machine code monitor, as well as a complete software library.

Ohio Scientific's Superboard II was designed for the first-time hobbyist, student, or serious computer user so it comes without a power supply or case. Any +5 volt DC 3 amp supply powers it up. The Superboard II packs in a lot of personal computing for an extremely low suggested retail price of $279.

Superboard II is also available as Challenger 1P complete with power supply (on the same board) and case for only $349. (Export prices for either model are slightly higher.) For more information contact Ohio Scientific, Inc., 1333 S. Chillicothe Road, Aurora, OH 44202; (216) 562-3101. *Circle No. 128.*

1800 Dispersed Processor from Datapoint

Datapoint Corporation has announced its new 1800 Dispersed Processor, a low-cost, multi-function data processing system designed for business applications. An advanced hardware design coupled with a comprehensive array of easy to use software, the 1800 provides extensive capabilities as a stand-alone system, as a member of an Attached Resource Computer system, or as part of a wider, geographically-dispersed network. Part of

the Datapoint family of compatible processors, the 1800 allows users to complete a wide range of business data entry, processing and communications tasks quickly and easily.

The 1800's powerful processor controls all system operations and is available with 60K bytes of user memory. The 1800's display memory is fully programmable, allowing for the generation of 128 characters under program control. The large, 80-column by 24-row video display screen can display inverse video (dark characters on a light background) on a character-by-character basis. Blinking and split screen displays are also available for more effective operator prompting.

The 1800's 55-character keyboard provides a full set of upper- and lowercase and special characters, and is organized in the standard typewriter layout. In addition, an 11-key numeric pad is included, as are five processor control keys. Also included are five programmable function keys that may be used for tab or cursor positioning or for program branching statements.

The 1800 keyboard is easily detachable. By simply pressing two release buttons, an operator may move the 1800 keyboard to a more comfortable position as a one meter cable links the keyboard with the processor.

The communications interface integral to the 1800 permits both autodial and auto-answer operations in the synchronous, bi-synchronous, asynchronous and SDLC line protocols. The 1800 processor, keyboard, video display screen and communications interface are combined in housing suitable for any business environment.

Included with the 1800 Dispersed Processor is a dual-drive diskette module. Using double density diskettes, the module can store up to one million characters of information. The 1800 supports up to four of these modules, for a maximum on-line storage capacity of 4 MB. In addition, the 1800 is compatible with nearly all Datapoint peripherals, including line, belt and matrix printers, magnetic tape units, communications modems and many others.

The 1800's comprehensive software capabilities fully complement its advanced hardware design. Interactive COBOL and DATAFORM are available on the 1800 for data entry applications. For data processing, programs in BASIC, COBOL, RPG and DATABUS may be written, compiled, and executed on the 1800. Datapoint's DATACCOUNTANT General Ledger, Payroll, and Professional Time Accounting applications software packages are also available for use with the 1800.

Datapoint's Disk Operating System (DOS) provides a basic framework for operations and includes handy utility programs such as LIST, SORT, and EDIT. The DOS common file structure means that files created on the 1800 are compatible with any other Datapoint system (and vice-versa). In addition, programs compiled on the 1800 may be executed on any other Datapoint system.

The 1800's extensive communications features make it a valuable member of any network. For batch teleprocessing applications, the 1800 can emulate the 2780, 3780, HASP and RES line disciplines. Data inquiry can be accomplished with the 1800 using the standard teletype protocol (TTY).

Datapoint's MULTILINK language may be used for real-time communications with a remote host mainframe, including tasks that require processing a remote database. The 1800 can also participate in Datapoint-to-Datapoint networks using the DATAPOLL, where programs can be down-line loaded to allow central control of remote operations.

As an applications processor in an ARC system, the 1800 can be used to enter, process and communicate data just as in its stand-alone and networking modes. In addition, the 1800 has access to all system resources, including the common database, communications links and printing facilities. Only the addition of an ARC interface is required for the 1800 to participate in ARC system operations; no hardware modification or software revision is necessary.

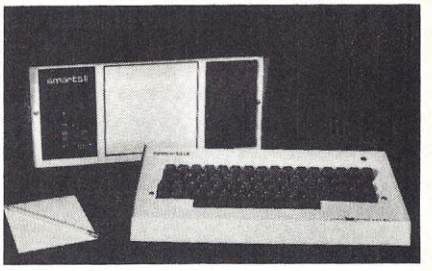
The processor has a purchase price of $12,500 and a three-year lease rate or $377 per month. The maintenance fee is $124 per month. Additional one million character diskette modules may be purchased for $4,100 each (the three-year lease rate of additional diskette modules is $115 per month each).

For more information contact your local Datapoint sales office or Datapoint Corporation, Attn: Data Processing Division, Marketing Communications (M62), 9725 Datapoint Drive, San Antonio, TX 78242; (512) 699-7059. *Circle No. 136.*

Smarts II

The Smarts II microcomputer is a business data processing system for home use.

Starting with 32K of RAM memory, the Smarts II system can expand simply and economically to a maximum of 630K of RAM. The mini floppy disk drive can be increased to three drives or can be added to the one RS 232 interface port. Other accessories such as a CRT terminal, printer and many other such peripheral devices may be added.



The Smarts II gives you a full 16 lines of 64 characters per line on a standard ASCII keyboard. Color displays (7 by 9 characters) can be created on your color TV screen accompanied by action sounds from the TV speakers.

Included in the system are games, income tax, bookkeeping, inventory and educational programs.

It is easy to learn computer programming with the computer fundamentals that accompanies every Smarts II microcomputer.

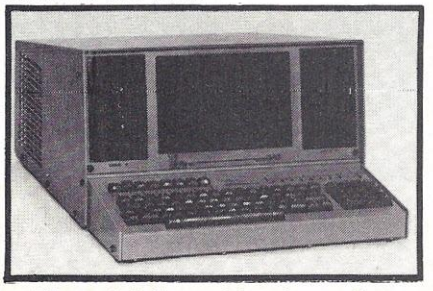
For more information contact Fire Bird Sales Co., P.O. Box 116 - 03 Oak Street, Woodland, IL 60974; (815) 473-4213. *Circle No. 134.*

Processor Terminal Series

CMC Marketing Corp. has announced the availability of another model in the new Processor Terminal series. Designated the TEI PT208, this new design is a complete and self-contained computer system with display, disk storage, a full keyboard and an 8-slot motherboard. It may be used either as a standalone processor or as a processor terminal in a larger system.

Features of the PT208 include a 9"

high-resolution monitor, a full upper and lower case ASCII keyboard with eight user designated special function keys and a 16-key numeric cluster pad. Two Shugart SA-400 mini-floppy disk drives are standard. The 8-slot mainframe contains a CPU board that features an 8080 processor and a special circuit that implements a start up "jump to" routine to any user selected byte address. Press the reset switch and the system boots to your preselected address. 32K static RAM memory is provided with additional RAM as an optional item. A disk controller handles three mini-drives. The minidrive media is soft sectored and has a capacity of about 90 KB unformatted. The video controller board uses a 24 x 80 format with many special features. The I/O board provides three parallel and three serial ports with selectable baud rates of 75 to 9600. Outputs are RS-232C and TTL.



The unit is housed in a heavy duty aluminum cabinet with power provided by a constant voltage transformer (CVT) power supply that makes brownouts a thing of the past. Fan, washable filter and a full complement of spare edge connectors for ancillary cards are available, along with optional software for the PT208, including CP/M operating system, SuperBasic and Fortran. Cobol is coming shortly. The processor terminal Model PT208 fully assembled and tested is priced at $4695. OEM and dealer pricing is available upon inquiry. Other models in the PT series include the PT408/80, PT212/80, PT112 and the MCS-PT412/80.

For more information contact CMC Marketing Corp., 5601 Bintliff, Suite 515, Houston, TX 77036; (713) 783-8880. *Circle No. 135.*

Desktop Computer with Large Memory Capacity

A new desktop computer featuring a large memory capacity, plus Assembly language programming capability and enhanced BASIC, was introduced by Hewlett-Packard.

The HP System 35 models A and B fill a growing need for a mid-range, large memory, scientific and engineering desktop computer to use in computation and data acquisition applications. The Assembly language programming option provides performance improvements of 2 to 100 times (depending upon the application) over traditional desktop computer languages.

Both models feature expanded read/write memory capacity of up to 256K bytes, unified mass storage, a tape cartridge directory in read/write memory and a "bad memory" error detect message system.

The interface cards include the Hewlett-Packard Interface Bus (HP-IB), 16-bit parallel, RS-232-C, and BCD. A realtime clock interface adds realtime reference and time-related control capabilities to System 35.

Both computation and I/O can be accelerated because Assembly language allows the programmer to converse directly with the computer's CPU in its own internal language.

Standard memory for the System 35 is 64K bytes of read/write and 16K bytes of read-only memory. The user read/write memory is expandable in increments of 64K to the full 256K bytes. At this maximum configuration, a System 35 can manage a 30,000-element array of 12-digit floating-point numbers or solve 170 simultaneous equations with 170 unknowns.

With the new smaller HP ROM configuration, read-only memory can be expanded to a total of 128K bytes. ROMs available at introduction include input/output – compatible with the System 45, and a plotter, and mass memory ROM. The last enables the HP System 35 to communicate with external tape memory and flexible disc memory.

Standard for both models is HP enhanced BASIC. In addition to handling programs written in ANSI BASIC, HP enhanced BASIC makes available to users such FORTRAN-like capabilities as sub-programs, multi-character identifiers, large-scale array operations, line labels and flexible output formatting. Optional character sets include French, German, Spanish and Katakana.

As is characteristic of most desktop computers, many peripherals have been integrated into the System 35, including interactive keyboard, alphanumeric display (a 24-line CRT for Model A, a single-line display for Model B) and an internal tape cartridge drive with a capacity of 217K bytes per tape. An optional 16-character thermal strip printer is also available for users who require low-cost permanent copy for such applications as data logging or program debugging.

The use of HP enhanced BASIC on both the HP System 35 and HP System 45 greatly simplifies the exchange of data and programs between the two machines. Because of their common language, System 35 and 45 share an extensive library. Programs available for the System 35 at introduction include a utility pack (with plotter graphics), basic statistics and data manipulation, regression analysis, numerical analysis, non-linear regression and statistical plotter graphics.

U.S. price of the 9835A is $9,900, the 9835B is $8,700. First customer shipments are expected to begin in early January.

For more information contact Inquiries Manager, Hewlett-Packard Company, 1507 Page Mill Road, Palo Alto, CA 94304; (415) 856-1501. *Circle No. 138.*

Integrated Microcommunications System from Vardon

The newest addition to Vardon's line of data communications equipment is the Vardon Integrated Microcommunications Terminal. This state-of-the-art device combines all the functions of standard office typewriters, word processors and computer terminals with the communications capabilities of TWX, Telex, DDD and Private Line networks, said company officials.

The system uses virtually any RS-232 printer for interaction between the operator and the Terminal or communications line. The Terminal utilizes

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93 YACHT RACING/CRUISING. You can have 10 issues delivered to your home for $12.00 — a saving off the regular $15.00 yearly rate. This is the magazine for the serious one-design and offshore sailor. For yachtsmen who sail everything from Sunfish to 73-footers. Covers the whole exciting world of sailboat racing and performance cruising.

88 THE RUNNER. The new magazine, not just on running and runners, but on health, biology, and the state of mind running expresses. Now you can order 9 issues for $8.97. The regular rate for THE RUNNER would be $13.50, so this is a saving of over 40%.

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90 CUE New York. Subscribe and get 16 issues for $10, saving half the single copy price. (On newsstands you would pay $20 for 16 issues.) CUE New York tells you all about what goes on in America's entertainment and cultural capital. CUE's critics and contributors tell you about the best shows, films, concerts, all entertainment. They keep you up-to-date on book fields and the record industry, profile your favorite entertainers. Use CUE if you live in or around NEW YORK and use CUE New York if you visit the city.

77 BACKPACKER MAGAZINE. Order a trial subscription of 4 bimonthly issues for only $5.95. Single copy price for these 4 issues would be $10.00.

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94 MEDIA & METHODS. Subscribe now for $9.00 (9 issues). The regular cost of 9 issues would be $11.00. The NEW YORK TIMES calls this magazine, "The most exciting magazine going into the schools these days." It is packed with vital information on films, reviews of paperback books and new teaching methods.

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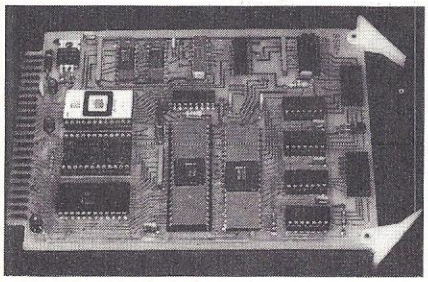
up to 64K bytes of storage and uses approximately 6K bytes for housekeeping. This allows the operator the capability of prompting and editing for routine work processing and message preparation. Additional storage can be implemented in modules for a variety of functions such as payroll, inventory and general ledger accounting.

Nationwide Service for the new Integrated Microcommunications Terminal will be available from Vardon through over 400 authorized service centers.

For more information contact Joe Gaynor, Vardon & Associates, Inc., 930 N. Beltline Rd., Irving, TX 75061; (214) 252-7502. *Circle No. 133.*

8085 Microcomputer Card

The SSM-85/1 is a general purpose industrial quality single-board computer measuring 4.5 x 6 inches. The card features a 4 level programmable



interrupt, 1280 bytes of RAM, 1K bytes of EPROM that is expandable to 4K bytes, 22 parallel I/O lines, a serial I/O port, a programmable 14 bit binary counter/timer which is controlled by the system 3Mhz crystal and a micro-monitor resident on the EPROM which communicates through the serial I/O port. The CPU instruction cycle time is 1.33 μsec and is software compatible with the 8080A. In addition the card may be powered by a single +5 volt supply by using 2K EPROMs. Delivery is from stock.

Assembled Card price is $289. The Micro-BASIC PROM lists for $49. For more information contact System Service, 12120 Rochester Ave., W. Los Angeles, CA 90025; (213) 826-8961. *Circle No. 132.*

Low-Cost 16-Bit Single-Board Computer With Non-Volatile Memory

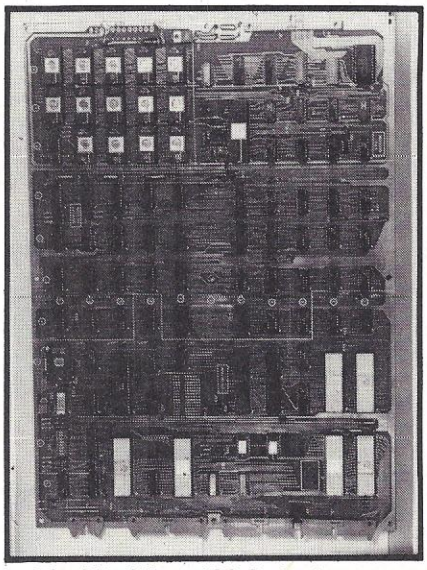
A new MiniMizer 100 Series of low-cost, single-board, OEM computers from Stynetic Systems Incorporated has been announced.

The MiniMizer 100 Series is a single-board computer containing a full 16-bit, general purpose processor and a complete computer system ready to be put to work in applications such as industrial automation, small business systems, instrumentation, communication systems, data entry, etc. Each MiniMizer 100 contains three types of memory (RAM, PROM, and EAROM), dual digital cassette controller, serial communication controller, programmable real time clocks, programmable event timers, memory protection registers, and 32 general purpose input/output lines all in addition to the basic 16-bit, high speed processor.

According to the company, the first MiniMizer 100 Computer will be the cornerstone of a compatible family of single card machines to be introduced during the next twelve months with such options as a floppy disk controller, a multiline communications controller and analog I/O already in design.

Each MiniMizer 100 unit incorporates an advanced 16-bit high performance multiple general register architecture similar to the popular PDP11 architecture. Memory includes 32KB of MOS RAM, sockets for up to 28KB of UV-PROM, and 2KB of Electrically Erasable ROM (EAROM). This unique EAROM memory makes the MiniMizer 100 Series the first computer to offer electrically alterable, non-volatile RAM memory without the need for batteries of any kind, according to the company.

Additional features on the single-card computer include a controller for dual, high speed digital cassette drives (1KB/sec), a programmable serial line controller with speeds from 110 baud to 19.2K baud, a programmable real time clock with 16 user selectable rates, up to 6 programmable event timers, a software programmable memory protection and allocation register, and 32 general purpose input/output lines for user interface functions.



The MiniMizer 100 Series is supported by a PROM resident Executive Program that features conversational command structures, on-line debug programs, relocating loader, device I/O utilities, interrupt handlers, real time clocks, extended math functions, file and data management routines and more. Over 8KB of PROM memory saves the user thousands of words of application program.

Software development is supported by a variety of assemblers, text editors, relocating-linking loaders, object module linkers and debug aids. Programming time is also saved because MiniMizer 100 programs can be written in BTRAN, a high level language that combines the best features of BASIC and FORTRAN, yet maintains the execution speed and memory efficiency of assembly language.

For more information contact Stynetic Systems Incorporated, Flowerfield Bldg. 7, St. James, New York, NY 11780; (516) 584-5596. *Circle No. 131.*

System from PCC and CMC-France

Pertect Computer Corporation (PCC) and CMC-France, an independent computer manufacturing and marketing company in France, have announced an enhanced distributed

data entry system.

The new multi-function system offers all the high-volume data capture capability of the field-proven CMC 1800. Additional features include optimized control of file inquiry, application program processing and communications with host systems.

These functions, said the company, are integrated in a manner transparent to the user through a Data Management Operating System (DMOS). Seventy tasks can be in operation at any time through a combination of terminals and peripherals; 64 can be interactive and the remaining six are reserved for CPU-oriented batch processing.

In addition to keystations with 256-character screens, the CMC 1800 Version 3 offers 2,000-character desktop terminals that may be cable connected as far as 2,000 feet from the system.

Bisynchronous communications facilities emulating IBM 2780/3780, 360/20 HASP multileaving and 3741 extended protocols are also available. Two programming languages are available for the system: KOBOL (Keystation On-Line Business-Oriented Language) for foreground data entry tasks and RPG II for background processing.

For more information contact PCC, 12910 Culver Blvd., Los Angeles, CA 90066; (213) 822-9222. *Circle No. 139.*

Network of Distributors for VDP-1000

The Data Products Division of Lear Siegler, Inc. is building a network of distributors to market the company's small business computer system, the VDP-1000.

The company expects the distributors to be systems houses, service/time sharing bureaus and other firms that have access to programmers. The distributors will have responsibility for creating applications software, with Lear Siegler backing them with its applications engineering group.

Programmable in BASIC, COBOL, and ASGOL (ASGOL is a copyright of RMD & Associates, Inc.), the VPD-1000 features a Virtual Memory Operating System (VMOS) with an extensive instruction set. Unlike most small computer systems the VDP-1000's operating system and application program are resident on its disk. Thus, they are automatically brought into the system in segments, as required. This enables users to develop larger scale programs, considerably beyond the VDP-1000's 32K word memory capacity.

For more information contact Lear Siegler, Inc., 714 North Brookhurst, Anaheim, CA 92803; (714) 774-1010. *Circle No. 250.*

Desk Top Computer from Logical Machine Corporation

Logical Machine Corporation, manufacturer of the small business computer ADAM, has announced TINA, a desk top computer. TINA utilizes the methods first established by ADAM of using the English language to help the buyer avoid prepackaged software and professional programming help.

Packaged in three modules, TINA

fits on a standard office desk top. The video display unit and its detachable keyboard house the entire central processor and memory circuits. A separate medium speed printer is standard, but an optional high-speed printer is also available. The third module utilized is a dual floppy disk drive. One disk is assigned to retain the vocabulary taught to the computer by the user and the other disk stores the information in the files needed by the user. The floppy disks utilized hold 1.25 million bytes of information, and TINA allows the file disk to be changed in the middle of a job, thus enhancing storage capacity.

Suggested retail price is $14,995. For more information contact Andrea Dodd, Logical Machine Corporation, 1294 Hammerwood Avenue, Sunnyvale, CA 94086; (408) 744-1290, ext. 230. *Circle No. 129.*

Integrated Association Management System

System Automation Corporation has introduced their Integrated Association Management System (IAM). IAM is a specially designed minicomputer system geared to the everyday requirements of associations, charities and other organizations with large volume billing, correspondance and mailing. IAM performs the essential financial functions (accounts payable and receivable, payroll, general ledger), and has membership services capability where it can perform membership billing, mailing label printing, letter writing, management reporting and other critical records and analysis.

IAM is an off the shelf configuration, but can be tailored to the users specific needs complete with a warranty. Its modular design allows for expansion.

IAM provides the user with the option of selecting standard reports on a predetermined schedule or as the user requires them. Its special query feature provides the user with the capacity of finding out what's in the data base in an amazingly fast response time.

The system was carefully designed, and no special knowledge of computers or data processing is required to use it. IAM guides the user through the desired application with logically arranged prompts.

For more information contact Barry Kleiman, Marketing Representative, System Automation Corporation, 8555 Sixteenth St., Silver Spring, MD 20910; (301) 565-9400. *Circle No. 130.*

PERIPHERALS

Impact Printer Features Switch-Selectable Forms Control

A plain paper impact printer with tractor drive forms control was introduced by Integral Data Systems, Inc.

The Integral IP-225 Impact Printer features tractor drive forms control with eight switch-selectable sizes from 3″ to 14″. Printing multiple copies on pin-feed fanfold paper and forms up to 8½″ wide, the microprocessor controlled RS232C and parallel TTL compatible unit provides a full upper and lower case ASCII character set (96 characters). It achieves an instantaneous print rate up to 100 cps with a sustained throughput of 50 cps.

The integral IP-225 Impact Printer measures 20" L X 7"H X 13½" D. weighs 27 lbs., has a reinking ribbon and few moving parts. Character format is 7 X 7 dot matrix; line length is 77 columns at 10 cpi with line lengths to 126 columns and print rates to 165 cps. Software and switch-selectable print densities of 8.3, 10, 12 and 16.5 cpi, a full CRT multi-line buffer (2048 characters) and graphics capability with contiguous horizontal and vertical dot plotting are optional.

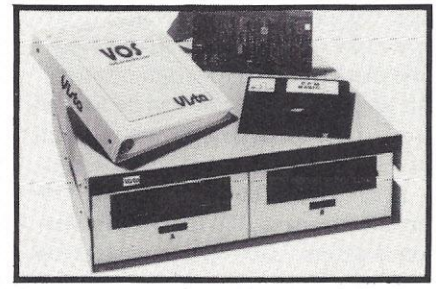
For more information, contact Integral Data Systems, Inc., N.Lamade, Director of Sales, 14 Tech Circle, Natick, MA 01760; (617) 237-7610. *Circle No. 140.*

Vista Floppy Disk System

Vista Computer Company announced a floppy disk system called the V500 Series, compatible with all Z-80/8080-based microcomputers. Using a standard Digital Research CP/M Operating System, the V500 transforms each microcomputer into a powerful tool, useful in a wide range of applications.

According to Vista, the V500 System provides fast-access; 512K of online storage; instantaneous program loading and dumping; efficient file management including random access; context editing of programs and text; dynamic debugging of programs; program assembly; and batch processing.

Each V500 Series Floppy Disk System includes: two floppy disk drives completely assembled in a case with power supply, fan and power switch; an S100 bus controller card that plugs into the computer and controls up to four drives (this system capacity can be expanded just by adding drives); I/O cable connecting the controller to



the drives (Vista customizes to individual I/O requirements); system software composed of the Vista CP/M (VOS) Disk Operating System and BASIC-E compiler (CBASIC optional) recorded on 8" diskettes; operating/instruction manuals. With CP/M you can store up to 64 dynamically allocated, named files on each diskette. Files may be any length up to a maximum of 250K bytes. Files can be transferred back and forth between the user's disk and Tarbell cassette or any other devices. Files may be duplicated by copying them onto back-up diskettes. For more information, contact George McMurtry, President, Vista Computer Company, Dept. P1, Torrance, CA 90503; (213) 320-2880. *Circle No. 299.*

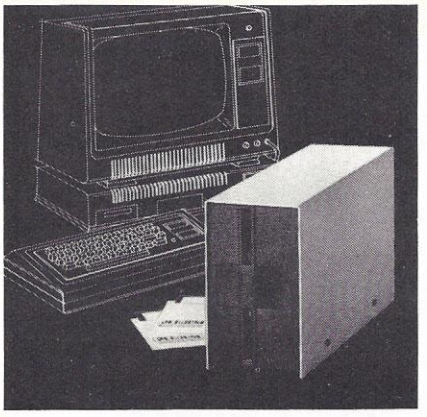
Percom Manufacturing Add-on Disk Drives for TRS-80

PerCom Data Company announced the development of add-on minifloppy disk drives for the Tandy Radio Shack TRS-80 computer.

The PerCom unit, which includes the drive, drive power supply, and enclosure, is identical in all important respects to the TRS-80 Mini-Disk System.

The drive itself is the proven Shugart SA-400 – the same drive used in the Radio Shack unit. The data transfer rate is 125 kilobits per second. Access time is a fraction of a second.

Drive power supply features overload current limiting and thermal pro-



tection.

Interfacing of disk drives to the TRS-80 computer is accomplished with the Radio Shack TRS-80 Expansion Interface, which accommodates up to four drives (and other peripherals), and includes controller electronics and a four-drive cable. Operating software for all drives is obtained by the user with the purchase of the first drive from Radio Shack.

The PerCom unit price is $399. The Radio Shack Mini-Disk System lists at $499. For more information, contact PerCom Data Company, 318 Barnes, Garland, TX 75042; (214) 272-3421. *Circle No. 298.*

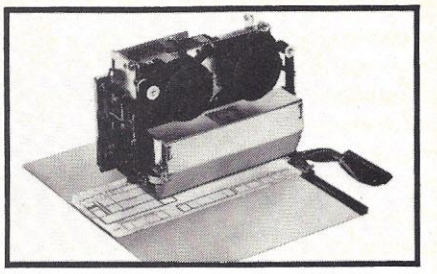
40-Column Dot Matrix Impact Card Printer

The new Model 542 Dot Matrix Impact Printer, sold by C. Itoh Electronics, Inc. and manufactured by Shinshu-Seiki is designed to print a 5.9″ wide × 3.15″ high card or ticket printout. With serial data entry, and friction feed, it prints 3 lines per second with 64 ASCII character set and 40-column capacity. Its inking may be ribbon or impact paper.

Model 542's exclusive dual warranty includes continuous duty head life of 100 million characters and mechanism life of 5 million print lines MCBF (mean cycles between failure).

Powered by 24V motor and 30 to max 45V solenoids, its mini-size is only 5.7″ H × 6.9″ × 4.7″ L, 5.1 lbs. Sample quantities are $235 each. OEM discounts are available.

For more information, contact Floyd Makstein, C. Itoh Electronics, Inc., 280 Park Ave., New York, NY 10017; (212) 682-0420. *Circle No. 297.*



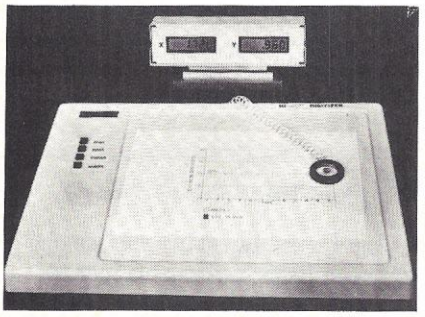
Complete Intelligent Digitizer

This 11″ by 11″ active surface digitizer offers user controllable features such as metric/inch capability, binary/BCD outputs, RS-232C/8-bit parallel interface, all selectable at the interface connector.

The HI PAD is accurate to ±0.015 inches with a resolution of 0.005 inches. The data rate may be set to input up to 100 coordinate pairs per second. Four buttons on the edge of the tablet allow the user to relocate the origin

and select point or stream modes of operation.

The unique cursor allows marking or non-marking of the curve being traced by merely depressing the cursor button at points being considered. An Optional Display is available. Unit Price is $795, FOB.



For more information, contact Gabrielle C. Ryan, Houston Instrument, One Houston Square, Austin, TX 78753; (512) 837-2820. *Circle No. 296.*

High Speed Printing Terminal

A 100 character per second DATAWRITER III Keyboard Send/Receive (KSR) Terminal has been introduced by Datagroup, Inc.

The terminal transmits 128 standard ASCII character codes typed on an 80 key alphanumeric keyboard with numeric/function keypad.

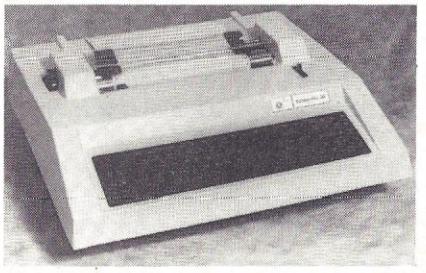
Ninety-five printable upper and lower case ASCII characters plus a special APL character set are printed in a 7 x 7 dot matrix at 13.6 character/inch using impact technology. Up to 136 single width characters per line are printed at 6 or 8 lines/inch vertical spacing, allowing up to 68 lines of 136 characters to be printed on 11" x 8½" paper. Double width printing may be selected or deselected at any point during the print line. The printer accepts multi-part continuous forms from 3 to 12 inches in width and accepts a widely available cartridge ribbon. Form feed and set top of form are standard features on the DATAWRITER III.

Transmission occurs at standard rates from 110 to 9600 baud over RS232 or current loop interfaces. The terminal buffers up to 255 characters in internal memory and has facilities to indicate buffer status to a host processor. Half/full duplex, parity select/on/off, here-is (transmission of teminal serial number), thorough terminal self-test, and terminal restart are standard features.

A set of internal switches select power on status of baud rate, line parity, half or full duplex, autoline feed, character set (ASCII or APL), and buffer status indication technique.

The terminal features high reliability because of design simplicity. All electronics are on a single module and the printhead is of field-proven reliability.

The main terminal cover need only be removed during installation, maintenance or ribbon changing. Forms may be changed without removing the cover. A removable, clear noise reduction printing area cover provides an excellent view of the last line and character printed. A page or more remains clearly in view after printing. The terminal is light, portable and measures less than 6 inches in height.



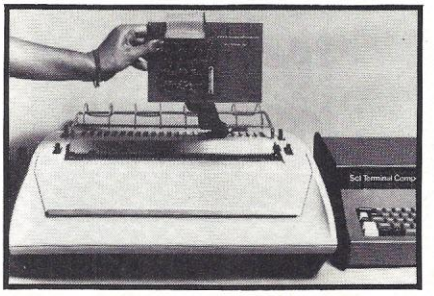
Of significant interest is the OEM pricing schedule which approaches $600 in quantity. The end user suggested price is $1721. For more information contact Michael D. Wise, 811 South 500 West St., Bountiful, UT 84010; (801) 290-0513. *Circle No. 295.*

Printer Interfaces

Two printer interfaces designed to increase the hard copy capability of the Sol Computer were announced by Processor Technology Corporation.

Sol Hytype I mounts inside any Diablo Series 1200 Printer connecting it directly to the back of the Sol. Similarly the Sol Hytype II Printer Interface works with the Diablo Series 1300 Printer. The installation package includes the fully assembled, tested and burned-in printed circuit board, software, all cables and mounting hardware. No modification to the Sol is necessary. No holes need be drilled in the printer. The printer can be restored to its original condition if required.

Hytype driver software is included on CUTS cassette along with a source listing. The user may modify the driver software to suit a particular application.



Suggested retail price for both the Hytype I and Hytype II is $150. Delivery is stock to 30 days. For more information, see your Sol dealer or contact Processor Technology Corporation, 7100 Johnson Industrial Drive, Pleasanton, CA 94566; (415) 829-2600. *Circle No. 294.*

Scorepad Features Partitioned Memory

Azurdata, Incorporated announced development of a new option for its hand-held data entry terminal, Scorepad. The memory partitioning option allows the terminal to record a new store order while retaining an order that is being processed. Also, the operator can enter store orders from different departments or for different vendors, using the appropriate operating program for each application.

According to Azurdata the length of memory partitions can vary, and the operator can move easily from one partition to another and back again to add more data as needed. The usual Scorepad actions of data entry, review, search or transmission occur within a defined partition without affecting another partition's memory. When the data in a partition is no longer needed, it can be deleted, thus freeing the data lines for use in a new partition without causing data loss elsewhere.

For more information contact Azurdata, Inc., P.O. Box 926, Richland, WA 99352; (509) 946-1683. *Circle No. 293.*

Two RS232 Interfaces for CP110 Printer from Okidata

Okidata Corporation has announced two new RS232 interfaces

for its CP110 matrix printer. One is microprocessor controlled with a choice of buffer sizes and the other is a low cost unbuffered version.

The CP110 prints 5 x 7 characters at 110 cps across an 80 column page using a unique bidirectional print mechanism that contains no brakes, clutches or dampers. Roll paper fits inside the case of the already compact (18" wide x 8" high x 22" deep) CP110 making it ideal for tabletop CRT hard copy applications. Tractor and pin feed models are also available. Font selection changeable on command, includes upper case, lower case and double width.

The new microprocessor-controlled RS232 interface operates in receive only, half duplex and full duplex modes. A 1968 character buffer allows for rapid transfer of a full 24 by 80 CRT screen without handshaking delays. Also offered are 128 and 960 character buffers. Switch-selectable asynchronous transmission speeds are 150, 300, 600, 1200, 2400, 4800 and 9600 bps. A friction feed CP110 with the new microprocessor-controlled RS232 interface and a 1968 character buffer sells for just $1110 in OEM quantities.

The new low cost unbuffered interface operates in simplex mode with a reverse channel busy signal at switch-selectable speeds from 150 to 9600 bps. A friction feed CP110 with the unbuffered RS232 interface sells for only $985, $125 less than the microprocessor version in comparable quantities.

The CP110 is also available with other interfaces including Centronics, HP 2640 series and Okidata's OEM parallel. In addition, a fourteen page Application Note booklet is available giving details on interfacing to an Intel 8080. A similar seventeen page document describes the Motorola 6800

Delivery of any of the CP110 models is forty-five days ARO. For more information, contact: John M. Capodici, National Sales Manager, Okidata Corporation, 111 Gaither Drive, Mount Laurel, NJ 08054; (609) 235-2600. *Circle No. 292.*

Calcomp Disk Drive Subsystems

California Computer Products, Inc. (CalComp) announced five additions to its disk subsystem family, with systems designed for use with the IBM Series I, Interdata, and HP 21XX and HP HP 3000 minicomputers as well as S-100 Bus microcomputers.

The subsystems are totally compatible with most popular minicomputers," according to CalComp. In addition to the new models, subsystems are offered for the DEC PDP-11 family, Data General Nova and Eclipse Series, and General Automation minicomputers.

Designed to allow users to optimize mass storage system needs and minimize CPU software overhead, the subsystems use the Trident family of removable pack disk drives and include controllers to allow the drives to be attached to the minicomputers.

The Trident drives offer capacities ranging from 25 to 300 megabytes. Each controller can handle up to four or eight Trident drives, depending

upon the computer interface selected.

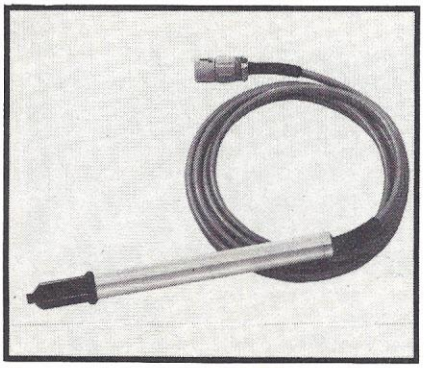
The subsystems feature full error detection and correction, selectable sector sizes, overlapped seeks and diagnostic software. Dual-access support is also offered on most systems, providing fail-safe, redundant path configurations to the data base. Average access time is 30 msec and data is transfered at speeds as high as 1209 K bytes.

Small quantities of one-drive subsystems range in price from $6,000 to $30,000, depending upon the minicomputer and size of disk drive. For more information contact CalComp, 2411 West La Palma Ave., Anaheim, CA 92801; (714) 821-2541. *Circle No. 291.*

LP-600 Light Pen

ICC has announced the LP-600 light pen. It's electronics are self-contained in the body using an ICC custom designed integrated circuit, signal processor. The pen operates from a single voltage power supply of plus 5V. It has a luminous sensitivity of 1.0 ft-L (P-31 phosphor, 60 Hz refresh rate. 0.020 diameter spot) and a response less than 300 nanoseconds.

The pen features adjustable sensitivity, a light weight, small diameter



for operator comfort, sharply defined acceptance area, multiple actuation methods and cables. Output signals which are TTL compatible, are available with their compliments if desired.

U.S. pricing for the model LP-600 in the 50 quantity is $175 each. For additional information and a complete catalog of ICC light pens contact Mel Morgan Manager OEM Customer Servives, Information Control Corporation, 9610 Bellanca Ave., Los Angeles, CA 90045; (213) 649-4869. *Circle No. 290.*

Tempest Version of New Terminal

Digital Equipment Corporation has unveiled the Tempest version of its newly-announced VT100 video terminal family, called the VT100T. A fiber optics communication link provides complete electrical isolation between the terminal and host computer system, thus eliminating system level shielding and grounding programs. A MIL-188C or EIA link is also provided.

The VT100T is electrically identical and logically compatible with the commercial VT100 terminal, while incorporating additional capabilities to meet Tempest requirements. This assures software compatibility and common logistics support for systems meeting either standard or Tempest requirements, according to Digital.

The new terminal features a detached keyboard; 44, 66, 80, or 132-column lines; double-width and height characters; smooth scrolling; and split-screen capability. The character font is an easily readable 7 x 9 dot matrix, and available character attributes include reverse video, blinking and underlined, as well as normal video at standard and dual intensity.

All functions such as baud rates, tabs, brightness, and parity are set using the terminal's keyboard. The functions are stored in non-volatile memory in the terminal, or are sent from a host central processor and stored in the terminal's volatile memory section. This eliminates the need for separate mechanical switches, thereby increasing terminal reliability.

The terminal can be upgraded from a relatively low-cost device to a sophisticated intelligent terminal with the LSI-11/2 microprocessor and up to 60K bytes of memory.

For more information contact Digital Equipment Corp., Merrimack, NH 03054; (603) 884-5111. *Circle No. 143.*

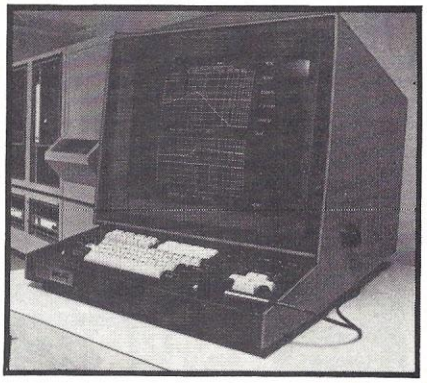
Ahl Data Systems Rent Gandalf Modems

Ahl Data Systems of Hinsdale, Illinois announces in cooperation with Gandalf, Inc., of Wheeling, Illinois, a rental plan for the users of Gandalf modems.

As an example, a LDS 120 modem costs $17.50 per month on a 12 month plan. Rental plans are usually custom designed to meet the users needs. The rental plan can be extended to as long as five years. For additional information contact Ahl Data Systems, P.O. Box 54, Hinsdale, IL 60521; (312) 323-0437. *Circle No. 144.*

Interactive Terminal Provides Refreshed Graphics Plus Total Software Support at Storage Tube Prices

An interactive graphics terminal with large screen, refreshed graphics dislay, complete software support for host and terminal and customer choice



of Light Pen or Joystick is available from IMLAC Corporation for $14,750. The DYNAGRAPHIC Series Model 3205 features a built-in terminal support software program. Together with a host/terminal FORTRAN library, supplied as an option, the DYNAGRAPHIC system allows users to generate and interact effectively with complex graphic/alphanumeric displays using simple FORTRAN calls for their application programs.

Low system costs make the Model 3205 practical for multi-station installations. The program, representing a one-time cost, supports a number of IMLAC terminals. It is optionally available at $750. DYNAGRAPHIC Model 3205 terminals are used with such host computers as PRIME 500, NOVA and PDP-11.

The DYNAGRAPHIC system, with refreshed display, permits modification or partial erasure of images during interaction without need to redraw the entire picture as is required with storage tube systems.

A Tektronix 4014/4010 Terminal

Emulator, available as a hardware option, allows users to readily access existing PLOT 10 programs.

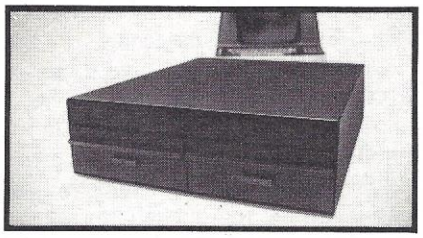
Included in the terminal are: 16K semiconductor memory, 19" refreshed image CRT, flexible 92-key Keyboard (with 16 lighted function keys), choice of Light Pen or Joystick and the built-in DYNAGRAPHIC terminal support software. Dual processors in the Model 3205 provide dedicated support for both the CRT display and user interaction respectively.

Additional information is available from Imlac Corporation, 150 A Street, Needham, MA 02194; (617) 449-4600. *Circle No. 142.*

8-Inch Floppy Disk Systems for M6800-Based Computers from Smoke Signal Broadcasting

Smoke Signal Broadcasting, manufacturers of M6800 microprocessor-based computer peripherals for the hobby and personal computing market, announced the addition of a family of 8-inch floppy disk drive systems to its product line.

The new family consists of three systems: the Model LFD-1, single drive,



single side, single density system; the Model LFD-2, dual drive, single side, single density system, both using the reliable Shugart SA-800 drive. Rounding out the family is the Model DFD-2, a dual drive, double sided, single density system based on the Shugart SA-850 drive.

Each of the new systems comes complete with a disk controller board, regulated power supply, chassis, cooling fan, diskette, and interfacing cables. The new disk controller board is capable of driving up to four disk drives.

A feature of the new drive system is the total compatibility of the disk operating system (DOS-68) and the Disk File Basic (DFB-68) with existing Smoke Signal Broadcasting software. No software changes are required.

The systems are priced as follows: LFD-1 = $1395, LFD-2 = $1895, and DFD-2 = $2495. All systems are available in less than 30 days.

For more information, call or write to Ed Martin, Smoke Signal Broadcasting, 6304 Yucca Street, Hollywood, CA 90028; (213) 462-5652. *Circle No. 147.*

Datacq Corporation Offers 21 Column Digital Printer with 20 Million Line Life

Datacq Corporation has introduced the Print Swiss 2500 impact-type printer. The Print Swiss 2500 incorporated the Seiko EP-101 print head which has 21 columns with 16 characters per column and prints 2.8 lines per second.

The Print Swiss 2500 is a parallel

printer, simultaneously accepting DTL/TTL compatible BCD data for all 21 columns. A floating decimal point capability is provided by 21 input lines that control the printing of decimal points between columns.

Two color printing and paper feed can be electrically controlled through input signals. A stand-by mode can also be electrically selected which turns off the motor if 5 seconds pass without receiving a print command.

The Print Swiss 2500 is a bench-top unit measuring 6" high by 9.5" wide by 15" deep. It weighs 15 pounds. Panel controls include Print and Paper Feed push button switches. All electronics are contained on a single printed circuit card and all IC's are mounted in DIL sockets for ease of service. Input power is 115 VAC at 0.25 amps.

The printer uses standard 3.5" wide paper rolls or fan-fold paper and incorporates a "paper low" microswitch. The paper low switch closure can be used to electrically inhibit printing and give a visual alarm. Access to the paper storage area is through a hinged panel on top of the printer.

Price is $925 and includes mating input connectors, power cord and paper. Delivery is from stock. For further information contact Michael Campo at Datacq Corporation, P.O. Box 3223, Monterey, CA 93940; (408) 649-6666. *Circle No. 145.*

Dual-Floppy Disk System

A fully integrated, dual-floppy disk system designed specifically for microcomputer systems has been announced by Vector Graphic Inc. Dual-Stor, as the new system is called, comes com-

plete with controller and dual floppy disk drive in a cabinet that matches the Vector I microcomputer.

The Vector Graphic Dual-Stor disk system has a storage capacity of 243K bytes per 8-inch diskette and utilizes the standard IBM compatible recording format. Using programmed data transfer, the Dual-Stor operates with both static and dynamic memories at a data rate of 250K bits/second.

Completely compatible with the S-100 bus, Dual-Stor features the famous Vector Graphic Reset-and-Go function on power up. Other features include state-of-the-art technology, extensive testing, and outstanding reliability.

Thoroughly tested and assembled, the Vector Graphic Dual-Stor comes complete with Disk Controller Board, DOS, Basic Compiler, Assembler, String-Oriented Editor and Debug Software. Suggested retail price is $2300 each. The Dual-Stor is available at all authorized Vector Graphic dealers.

For more information contact Yvonne Beck, Vector Graphic Inc., 31364 Via Colinas, Westlake Village, CA 91361; (213) 991-2302. *Circle No. 148.*

"X-ON" Protocol for Spinwriter Printers

NEC Information Systems has introduced an X-ON/X-OFF protocol enhancement for its Spinwriter series of

bi-directional character printers.

The new feature complements the ETX/ACK, and reverse channel protocols currently available for the hard copy terminals, and will be offered as an operator-selectable option on Spinwriter Models 5510 and 5520 at no additional cost.

Introduction by NEC of X-ON/X-OFF support for Spinwriters allows users to optimize throughput without special software drivers, according to the company.

Protocol allows Spinwriter printers to accept "unblocked" data streams from processors. Incoming data is stored in buffer memory immediately prior to printing.

As the buffer approaches saturation, the Spinwriter transmits an 'X-OFF' code, indicating that the processor should stop transmitting. The Spinwriter continues to print that data it has already received and stored in buffer memory.

When approximately three-fourths of that buffer space is empty again, the printer transmits an X-ON code, indicating that the processor should begin transmitting data once again. Officials said the X-OFF code is also transmitted whenever the Spinwriter cover is opened, paper runs out, or the ribbon requires replacement.

The Spinwriter series consists of two terminal models and an OEM version, each capable of printing bi-directionally at up to 55 characters-per-second.

The unique "thimble" element used by the microprocessor-controlled printers lasts up to 50 percent longer, prints faster and costs less than competing "daisy" type print elements. Dual-font thimble elements designed especially for word processing applications are available in addition to single-font elements.

Spinwriter terminals with the new X-ON/X-OFF protocol are available 45 days after receipt of order, priced at $2,775 in single-unit quantities for end users for the receive-only Model 5510 and at $3,090 in those same quantities for the keyboard send/receive Model 5520.

For more information contact NEC Information Systems, Inc., 5 Militia Drive, Lexington, MA 02173; (617) 862-3120. *Circle No. 150.*

80 Column Card Reader from Cardamation

A new vacuum feed 80 column card reader has been announced by Cardamation Company, a suburban Philadelphia peripherals manufacturer.

The CR 300 Card Reader operates at a speed of 300 cards per minute with card hopper and stacker capacities of 450 cards each. Its unique (patented) vacuum feed mechanism enables heavily worn or damaged cards to be fed with practically no card jams.

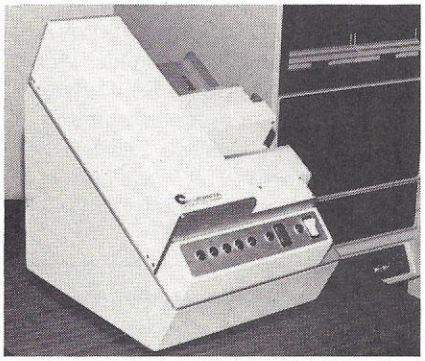
Recognizing the expanding market for a diversity of peripherals on minicomputers such as the IBM Series/1,

Cardamation announced the first in a series of low cost card oriented peripherals for the small systems market.

The CR 300 is a table top unit consisting of the card reader mechanism with input hopper, stacker and casework. The electronics includes power supply, motor controls, read station with checking logic and interface.

One of the interfaces available at no extra charge is a standard documation interface compatible with the family of card readers supplied by Documation, Inc. of Melbourne, FL.

List price is $2,875. OEM quantities are priced well under $2,000. Delivery is 45 days after receipt of



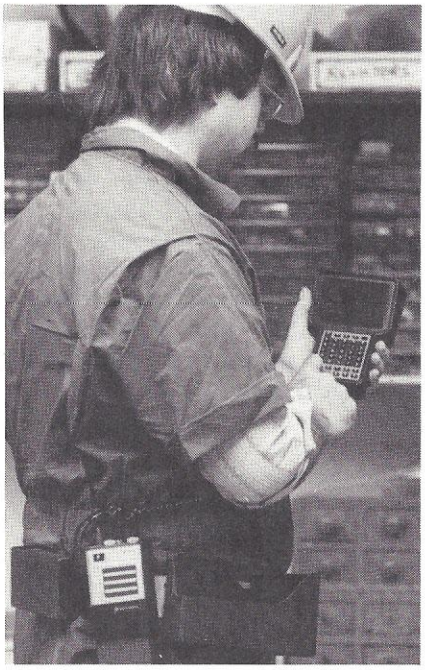
order. For more information, contact R.G. Swartz, Cardamation Company, 9A Frazer Mall, Frazer, PA 19355; (215) 647-8260. *Circle No. 149.*

Tera System from Taumark Inc.

TERA is a two-way, mobile data communication system utilizing F.M. radio, between hand held terminals and the main computer system. The communication range of the system is dependent upon radio power selected and site geometry. The low power system has a typical range in excess of 1.0 miles.

The hand held terminal consists of a full alpha-numeric keyboard and a 64 character display, combined with a portable radio to create a truly mobile terminal for those applications where real time access to the computer and freedom of movement are desirable.

The standard network controller includes all communication software and full in-out buffering for the terminals. The network controller communicates with the customer computer via either hard wired, phone line or other remote connections using RS-232-C or 20 Ma interfacing. The customer may choose asynchronous serial ASCII codes or optional bisynchronous 3270 ASCII



or EBCDIC emulation. TERA will support up to 250 terminals with a single base station radio.

First customer shipments began July 1978. Delivery is 150 days after receipt of order. Optional bar code wand will be available in December 1978.

For additional information contact Joseph C. Mirecki, Director of Sales, TauMark, Inc., 6621 Century Ave., Middleton, WI 53562; (608) 831-9291. *Circle No. 151.*

Product Sheet Describes Datamedia Programmable Terminal

A two-page product sheet describing the Elite 4000A Programmable Terminal System is available free of charge from Datamedia Corporation.

The two-color bulletin provides information about the Elite 4000A, a highly flexible, modular computing system that gives designers flexibility not previously available in display formatting, text editing, data collection and processing.

The sheet outlines operating features of the terminal system – including its block-oriented display organization for fast insertion, deletion, or rearrangement of text; interrupt-driven, vectored I/O; direct memory access capability; 8-level video; stored memory tag bits; expandable display memory (to 32K); expandable I/O; expandable character set; and switch-selectable soft/hard keyboard – and

specifications for use by both end users and OEM firms.

For more information contact Datamedia Corp., 7300 N. Crescent Blvd., Pennsauken, NJ 08110; (609) 665-2382. *Circle No. 289.*

Anderson Jacobson and Racal Vadic 1200 BPS Full Duplex Acoustic Coupler

A new 1200 bit per second full duplex acoustic coupler is available from Anderson Jacobson (AJ) and Racal Vadic. The coupler will be marketed by Anderson Jacobson as the AJ 1234 and by Racal Vadic as the VA 3434.

The AJ 1234/VA3434 will have impact on users of acoustic couplers who settled for 300 bps full duplex operation. Now, merely by replacing their

Answers to History Quiz

1. b	13. d	25. a
2. b	14. b	26. a
3. a	15. b	27. a
4. b	16. Leibnitz	28. a
5. b	17. c	29. a
6. d	18. a	30. a
7. c	19. b	31. a
8. c	20. b	32. b
9. a	21. c	33. d
10. b	22. b	34. b
11. a	23. a	35. b
12. false	24. d	36. b

present coupler with the new AJ/Vadic unit, they will be able to increase their full duplex data transmission speed by a factor of four, while still retaining the portability that an acoustic coupler provides.

With the announcement of the new unit, users may now select either a 1200 bps full duplex acoustic coupler or a 1200 bps full duplex modem. Like the Vadic VA3400 modem, the new acoustic coupler provides an asynchronous 1200 bps full duplex interface to the computer or terminal but transmits information on a synchro-

nous basis between itself and the remote modem. Users may also select DAA operation.

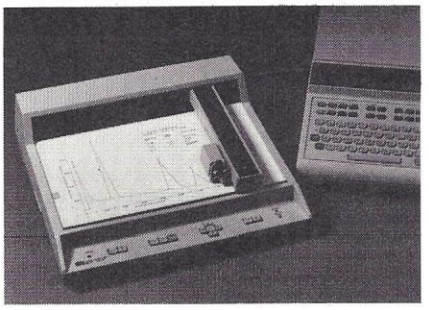
The new acoustic coupler was designed using techniques developed for Vadic's VA3400 which, when introduced in 1973, was the industry's first 1200 bps full duplex modem. Both companies agree that the data transmission frequencies used in the VA3400 modem provide the best means of securing acceptable performance from a full duplex acoustic coupler operating at 1200 bps. The VA3400 modem transmits data in the high band (2250 Hz) and receives data in the low band (1150 Hz). This places the second harmonic distortion, created by the carbon microphone found in most telephone hand sets, at 4500 Hz, which is well outside the band of the coupler's received signal. On the other hand, the Bell 212A transmits data in the low band (1200 Hz) and receives data in the high band (2400 Hz), which places the second harmonic of the transmitted signal right in the middle of the received band, making it difficult to acoustically couple this type of modem.

The unit price for the AJ 1234/VA3434 is under $900. OEM quantity prices are available. For more information contact: Bob Miller, Product Manager, Data Communications Division, Anderson Jacobson, 521 Charcot Avenue, San Jose, CA 95131; (408) 263-8520. or Tom McShane, Vice President Marketing, Racal Vadic, 222 Caspian Drive, Sunnyvale, CA 94086; (408) 744-0810. *Circle No. 284.*

Low Cost Hard Copy Graphics for HP-IB (IEEE-488) Systems

A low cost graphics solution is now available for HP-IB (IEEE 488-1975) systems. The HP 7225A Graphics Plotter provides publication quality plots by drawing clean continuous ink lines. The plotter draws 'stepless' straight line segments of any length and angle given only the end point coordinate pair. Additionally, an extremely flexible modular interface system allows the easy change between an HP-IB interface and other popular interfaces.

The 7225A is designed to produce graphs in the most usable sizes by plotting on paper sizes up to ISO A4 or 8 8½" x 11". Addressable microsteps of 0.032 mm (0.00125 inch) provide visually continuous lines. Fast Continuous plotting is provided by drawing



between points at 250 mm/s. Text can be drawn at speeds up to three characters per second for quick annotation.

The mechanical system is based on a new linear stepper mechanism which combines rugged simplicity with state-of-the-art technology. The result is improved reliability through the elimination of most moving parts such as pulleys, cables, gears and slidewires. High resolution combined with this rugged design allows the 7225A to produce quality graphic representation even under long-term heavy use.

The user changeable 17600A Series Personality Modules control the interface, language and capabilities of the 7225A. A number of modules are now available, including HP-IB (IEEE 488-1975) and General I/O (8-bit parallel). This modular adaptability makes the 7225A fit both present systems and future planned systems.

Specifically, the 17601A Personality Module adapts the 7225A to use the Hewlett-Packard Interface Bus, HP-IB (IEEE 488-1975). Using the high level instruction set called Hewlett-Packard Graphics Language (HP-GL), 38 instructions are available for vector plotting, character set and line type selection, point digitizing, user-unit scaling, and labeling with programmable size, slant and direction of characters. The 17601A Personality Module is software compatible with the 9872 Graphics Plotter. In addition, the 17601A allows the 7225A to operate in a 'listen-only' mode.

Price of the 17601A Personality Module is $750 (U.S.); the 17600A is $150 (U.S.). The 7225A Gaphics Plotter is priced at $1,850 (U.S.). Delivery is eight weeks. For more information contact Inquiries Manager, Hewlett-Packard Company, 1507 Page Mill Road, Palo Alto, CA 94304; (415) 836-1501. *Circle No. 283.*

High Speed Intelligent Printing Systems Added to IPS-7000 Series by Dataroyal

Dataroyal, Inc. has introduced a higher-speed version of its IPS-7000 intelligent printing system, along with three new firmware packages that allow the printer to be configured in three different versions.

Each of those versions pairs a 160 character-per-second matrix printer with serial interface, and an eight bit microcomputer with RAM and PROM. Earlier IPS-7000 models combined that microcomputer with a 120 CPS printer.

Users can select any of three versions, depending upon the performance they require, and the firmware package they select, said Dataroyal President Ronald O. Huch. Changing the function of the printer as application requirements change or new applications develop is simply a matter of replacing PROM chips.

The 160 CPS intelligent printing system is available as the IPS-7201, able to print 64 ASCII characters in a 5 x 7 dot matrix; and the IPS-7208 and IPS-7209, each printing a 96-character set in 9 x 7 matrix. The IPS-7201 and IPS-7208 each offer a 500 character buffer, while the IPS-7209

features a 3,500 character buffer.

"Intelligent printint systems" said Huch, "are designed for users who think they need special peripherals for special jobs, or who believe they must develop or purchase custom interface equipment or re-program a mainframe each time they attach a new peripheral device."

Huch said the IPS-7209 can improve the productivity of terminal-oriented distributed processing networks, since its buffer is large enough to store an entire screenload of data. The 500 character buffer in the two other 160 CPS intelligent printing systems is large enought to improve throughput in communications applications. An RS-232-C asynchronous communications interface is standard, and a 20 mA current loop interface is available as an option on all three.

The IPS-7201 is priced at $2,130 for OEMs and $2,250 for end users in single unit quantities. Single unit OEM prices are $2,180 for the IPS-7208 and $2,230 for IPS-7209, and single unit end user prices for those versions are $2,325 and $2,410, respectively. Deliveries are 30 days after receipt of order.

For more information contact Dataroyal, Inc., Main Dunstable Road, Nashua, NH 03060; (603) 883-4151. *Circle No. 146.*

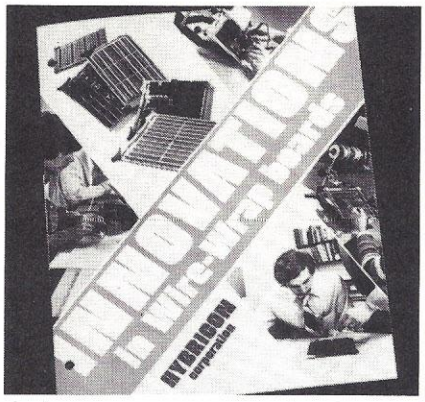
LITERATURE

Catalog Featuring Wire Wrappable Microprocessor Panels

Hybricon Corporation has published a new short form catalog covering it's line of wire-wrap panels and accessories. The 8-page catalog contains complete specifications on the company's line of standard panel designs, accessories and wire wrapping services.

Featuring 3 new microprocessor panel designs for the Intel 8010, Zilog Z-80 and the Motorola 6800 series, the new catalog provides complete details on the electrical and mechanical capabilities of these panels. All of the panels illustrated feature plated thru holes, multiple Vcc and ground planes and spacing for 0.300", 0.400" and 0.600" DIP's.

A description of a wide range of accessories is also included covering DIP



sockets, pins, connectors, component carriers and tools.

For additional information, contact Hybricon Corporation, Mr. D. F. Murphy, Marketing Manager, 410 Great Road, Littleton, MA 01460; (617) 486-3174. *Circle No. 101.*

Word Processing Flyer

Wang's new Word Processing System 5, a low-cost standalone CRT-based system, is the subject of a one-page flyer from Wang Laboratories. The system 5 features an 80-page system diskette, a 120-page archive diskette storage device, and can support a single printer. A CRT alternative to some electronic memory typewriters, the System 5 features advanced forms of key-stroke elimination and is easily upgraded to Wang's larger systems. Contact Wang

Laboratories, Inc., One Industrial Avenue, Lowell, MA 01851; (617) 851-4111. *Circle No. 123.*

Brochure on Semi-Intelligent Terminal Available From Lear Siegler

Computer users who want to upgrade to a more capable video display terminal can obtain a brochure on a new semi-intelligent CRT from Lear Siegler, Inc./Data Products Division.

The ADM-42, explains the six-page pamphlet, "provides you with flexibility of format, security, editing, interface and transmission. And, it features a full two-page display as standard equipment." The two 1920 character pages of memory are optionally expandable to eight pages.

Other capabilities of the ADM-42 include 16 function keys for 32 separate commands; incremental cursor positioning from the keyboard or a remote computer; blanking/underline, blinking and reverse fields; and a field protect mode preventing data from being typed over or over-written by the operator or remote computer.

The terminal's behavior modification feature is factory preprogrammed for compatibility with many industry standard computer systems. Parameters such as an alternate ESC sequence lead-in, end block character, new line character sequence, field separator and a function sequence preamble can be changed from the keyboard or computer to conform with the user's specific system or systems.

The brochure provides a complete list of the ADM-42's specifications such as a detachable keyboard with 128 character ASCII lower case, numerics, punctuation and control; a 15 inch diagonal display screen with 2000 characters formatted in 24 rows of 80 characters; and a 25th line reserved exclusively for status indicators and messages of up to 79 characters.

Options specified include synchronous transmission with various line protocols, extended memory and programmable function keys.

For further information contact Lear Siegler, Inc./Data Products Division, 714 N. Brookhurst, Anaheim, CA 92803; (800) 854-3805; in CA (714) 774-1010. *Circle No. 103.*

Dash LP2 Printer Brochure Describes 180-CPS Bidirectional Printers

A four-page brochure (#012-602), *For the End of Boring Output,* describing the DASHER LP2 Printers is available from Data General Corporation. Communications Services Department. The brochure summarizes the features and benefits of the 180-character-per-second, logic-seeking, bidirectional system printers.

For more information contact Data General Corporation, Communications Services Department, M.S. 82310, 15 Turnpike Road, Westboro, MA 01581; (617) 366-8911. *Circle No. 102.*

Disk Drive Maintenance Manual From Pertec Computer Corp.

A guide to the proper care, of disks and heads used in Pertec disk drives is available from Pertec Computer Corporation's Pertec Division.

Presented in four chapters are step-by-step instructions for the care and cleaning of disk drive heads and disks, recovery from head crashes, disk and head handling and cartridge handling and storage.

The 12-page booklet, tailored to the disk drive user who is not technically oriented, provides humorous illustrations and an analogy between disk drive and automobile upkeep, according to PCC.

Also included are suggested cleaning supplies, preventive maintenance directions and clarification of terminology.

For information contact Pertec Computer Corporation, Pertec Division, MS 40/04, 9600 Irondale Avenue, Chatsworth, CA 91311; (213) 999-2020. *Circle No. 107.*

48-Page Catalog for the Texas Instruments Minicomputer User

Minicomputer Accessories Corporation has created a 48-page catalog custom-tailored to the needs of the Texas Instruments minicomputer user.

Every product in this 48-page catalog is guaranteed for at least 45 days

and some products, like Minicomputer Accessories' Corinthian magnetic tape, are guaranteed for 10 years.

For a free copy or more information contact Minicomputer Accessories Corporation, Dept. P-7, Box 9004, Sunnyvale, CA 94086; (408) 737-8700. *Circle No. 104.*

Data Management Software System

DRS, a data management and retrieval system permitting non-technical personnel to establish data bases, transform and retrieve data, and generate reports – all without programming, is described in a new brochure available from ARAP of Princeton, NJ and SONCO of Bala Cynwyd, PA.

Designed to run on DEC PDP-11's, IBM 1130's and 360/370 systems, as well as Univac 90/60's and CDC 6000's, DRS features minimum memory requirements: occupying only 80K bytes on a PDP-11 and 256K bytes on 360/

370. The new brochure lists memory requirements for all systems (including IBM 1130 equivalents) and describes those types of applications for which over 100 organizations use DRS.

In addition to describing DRS' Select-Arrange-List-Execute simplicity, the new brochure also details: its associative data structure; its ability to generate memory-efficient data bases; its full complement of commands; its ability to link with other programs; its automatic indexing capabilities; and its flexibility in report-writing. For copies of the brochure entitled, *Data management for management,* contact ARAP, 50 Washington Rd., Princeton, NJ 08540; (609) 452-2950 or SONCO, 146 Montgomery Ave., Bala Cynwyd, PA, 19004; (215) 667-7670. *Circle No. 106.*

New 1979 Radio Shack Catalog Available

Available from Radio Shack stores and dealers nationwide, is the company's new 1979 catalog featuring their line of electronics products for

home entertainment, hobbyists and experimenters.

The 176-page catalog includes 112 full-color pages describing the latest in stereo components, CB equipment, personal computers, calculators, scanners, radios, hobby kits and hundreds of specialized electronics items, parts and accessories.

Among the items being offered for the first time are the Realistic STA-2100 AM/FM Stereo Receiver rated at 120 watts per channel, the "System Seven" mini-stereo and the LAB-500 quartz-lock automatic turntable.

For CBers Radio Shack will offer a complete line of base, mobile and hand-held two-way radio equipment with a top-of-the-line computer controlled AM/SSB base station featuring a built-in microprocessor.

Also being introduced in the catalog is the new Realistic DX-300 digital readout general coverage receiver.

For more information contact H.L. Siegel, 1400 One Tandy Center, Fort Worth, TX 76102; (817) 390-3272. *Circle No. 110.*

Heathkit Catalog Available Free

A 96-page catalog describing the latest in electronic kits is now available from Heath Company. Product cate-

gories for the kitbuilder include Amateur Radio, Color Television, High-Fidelity Components, Test Instruments, Digital Clocks, Weather Instruments, Personal Computer Systems, Auto,

Marine and Aircraft Accessories and many products for home improvement and family entertainment.

New products in the catalog include a Three-Way Linear Phase Hi-Fi Speaker System, the world's first true hand-held Aircraft Navigation Computer, a Logic Probe for checking TTL and CMOS digital circuitry, a Wireless FM Intercom and two Mobile FM Amplifiers for the amateur radio enthusiast.

For more information contact Heath Co., Benton Harbor, MI 49022; (616) 982-3417. *Circle No. 124.*

Booklet From Computer Automation Describes Simulator Program Listings and Printouts

A new 24-page booklet from the Industrial Products Division of Computer Automation describes in detail the listing and printout from the CAPABLE 4800 series of logic simulators. Sample listings are displayed throughout the text, and are fully explained. The aim of the booklet is to enable users of the CAPABLE 4800 series to become familiar with the way in which circuit descriptions and stimulus test patterns are processed to provide a completed test program and fault detection information.

The simulators enable a wide range of logic circuits to be modelled: from the more simple circuits using TTL and other logic families, to complex circuits containing LSI's and microprocessors.

The first part of the booklet deals with the four major segments within the system and describes their listing fully. The remainder of the book covers a broad range of listings from the test program for a six IC digital board.

Contact Industrial Products Division, Computer Automation, Hertford House, Maple Cross, Rickmansworth, Herts WD3 2XD; Telephone: 09237-71211. *Circle No. 117.*

Literature Available

A Tape Reader manual for the computer compatible stand-alone Model 612 describes the operation of this new model and details the characteristics of the options available, including an RS232C interface. The principles of operation are explained and installation and checkout are described. Contact

Addmaster Corporation, 416 Junipero Serra Drive, San Gabriel, CA 91776; (213) 681-3098. *Circle No. 118.*

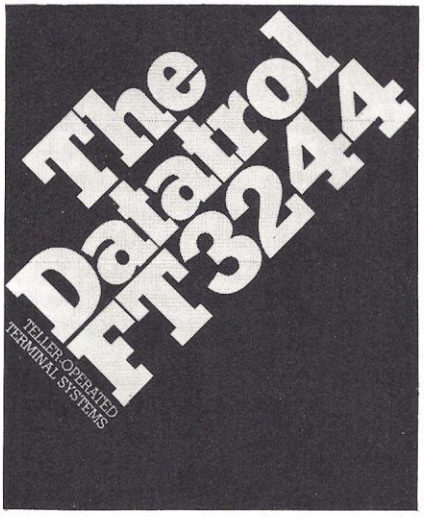
Teller-Operated Terminal Systems From Datatrol

Datatrol FT-3244 Teller-Operated Terminal Systems are featured in a brochure available from Datatrol, Inc.

The new FT-3244 system performs all traditional banking functions, prepares receipts and validating documents, and records numerous other terminal events, all at an average cost per terminal of about half that of competitive systems.

The cost saving is made possible by the terminal's advanced microprocessor technology. This enables direct communications via phone lines with the host computer and eliminates the need for an expensive branch-level controller. With the FT-3244, up to six terminals can communicate through one telecommunications drop on a multi-drop network.

The FT-3244 system by Datatrol will function on-line, partially on-line, or off-line. Also, it can be phased-in on a branch-by-branch, teller-by-teller



basis, without changing existing systems that are operating efficiently.

This terminal system is programmable and changing programs involves nothing more than a down line load command from the host computer.

For a free copy contact Datatrol, Inc., A subsidiary of Applied Devices Corporation, Kane Industrial Drive, Hudson, MA 01749; (617) 568-1411. *Circle No. 113.*

SBS Catalog

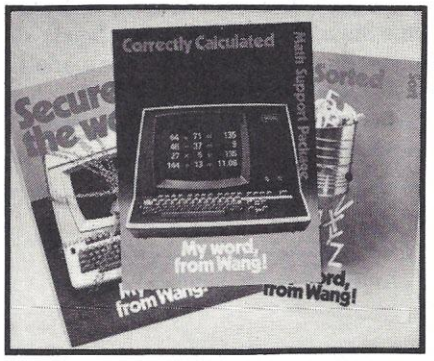
A new catalog contains information on all publications currently available from SBS Publishing. Each publication carries a summary of contents, size and scope as well as publication date and pricing information.

Additional material on SBS Publishing's upcoming seminars and on their four subscription services is included. The catalog is available at no charge from SBS Publishing. For more information contact Lawrence D. Dietz, Vice President, SBS Publishing, 4320 Stevens Creek Blvd., Suite 190, San Jose, CA 95129; (408) 243-8121. *Circle No. 125.*

One-page Flyers from Wang

A series of one-page flyers on Wang's new word processing software is avail-

able from Wang Laboratories, Inc. *Sort* software offers the user the following types of sorting: simple, by field, or



multi-key. *The Math Support Package* provides three modes of mathematical computation at varying levels of sophistication. A *System Security Option* features "password" entry with supervisory control, and a disk-erase capability for maximum security. For more information contact Wang Laboratories, Inc., One Industrial Avenue, Lowell, MA 01851; (617) 851-4111. *Circle No. 105.*

CMOS Microprocessor Products Guide From Harris Semiconductor

Harris Semiconductor Products Division has available a 36-page reference guide to the Harris family of HM-6100 microprocessor products. The guide covers the basic HM-6100 CPU, support circuits such as CMOS memories, bus drivers, communication circuits and I/O controllers.

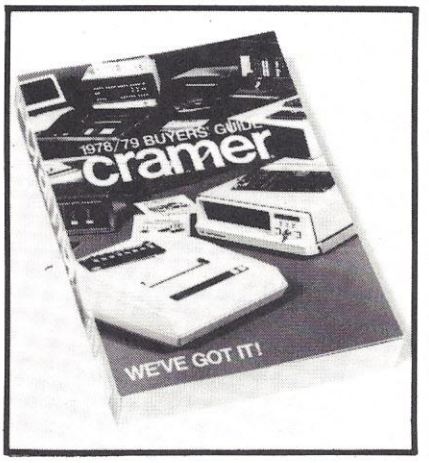
In addition, the guide provides information on support systems, support software, and describes a new CMOS single board 12-bit microcomputer designated the MICRO-12, which economically evaluates the HM-6100 CPU family.

Basic specifications, pin-outs, and product features are provided for all system elements. The guide will be of prime interest to engineers involved in the design of self-contained, low power low cost microcomputer systems.

Copies are available by letterhead request to Harris Semiconductor, Dept. 53-035, P. O. Box 883, Melbourne, FL 32901.

Cramer Electronics Offers Catalog

Cramer Electronics, Inc., has available it's new 780-page Buyers' Guide.



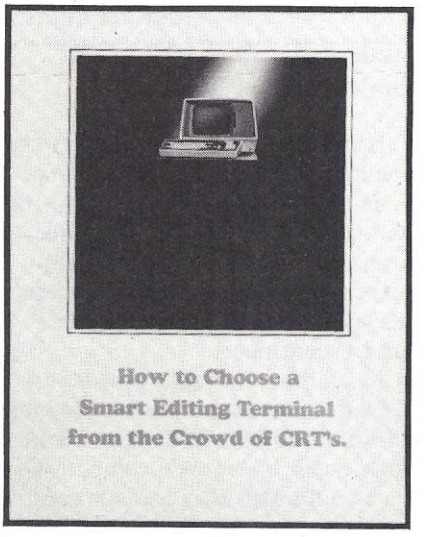
This catalog lists the quality components, systems, peripherals, instruments and tools that are available at local

Cramer stocking centers. Listed in the new 1978-79 Cramer Buyers' Guide are products made by such leading companies as Allen-Bradley, Amphenol, Bournes, Erie, Fairchild, General Electric, ITT Cannon, Mostek, Motorola, RCA, Sprague, Texas Instruments and about 80 more high quality manufacturers. Cramer offers components in over 50 product categories covering all active and passive areas plus a wide range of accessories.

For more information contact Cramer Electronics, 85 Wells Ave., Newton, MA 02159; (617) 969-7700. *Circle No. 111.*

Computer Supplies and Accessories

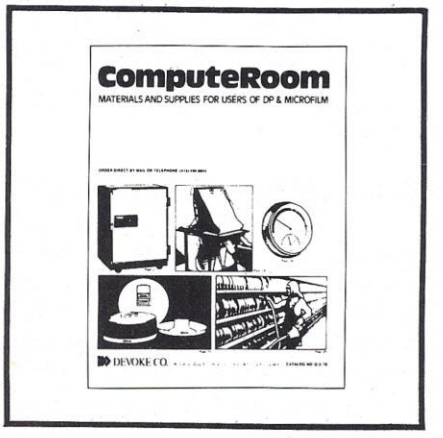
A full line of EDP magnetic media, supplies, and accessories is offered in *ComputeRoom,* a new 48-page catalog available on request. Included are magnetic tape, disk packs, cartridges, flexible disks and cassettes, along with their related handling systems. Also featured are microfilm retention and retrieval systems. Contact Devoke Co., 3780 Fabian Way, Palo Alto, CA 94303; (415) 494-8844. *Circle No. 112.*



Eight-Page Guide to Smart Terminals

How to Choose a Smart Editing Terminal from the Crowd of CRT's is the title of a new guide offered by EECO.

Eight pages cover what to look for in a Smart Editing CRT, a summary of major Smart Terminals on the market today, and a comparison of features between five leading manufacturers' products.



Contact EECO, 1441 East Chestnut Ave.; Santa Ana, CA 92701; (714) 835-6000. *Circle No. 116.*

TEST EQUIPMENT

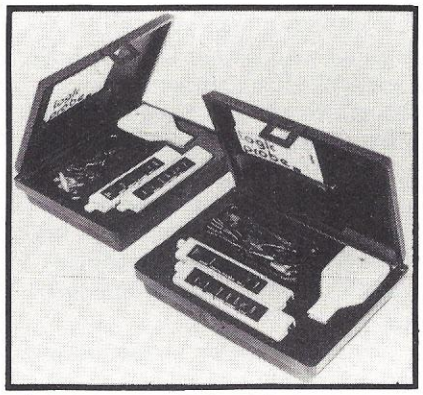
CSC's Logical Analysis Kit

Continental Specialties Corporation has combined elements of The Logical Force digital troubleshooting line into the self-contained model LTC-1 Standard Logical Analysis Kit for design, test, production line, educational and troubleshooting applications.

The kit comes in a carrying case and includes CSC's LP-1 Logic Probe, DP-1 Digital Pulser and LM-1 Logic Monitor plus manuals and application guides, accessory probe tips, adapters and leads.

The LP-1 Logic Probe offers a 0.1 Megohm input impedance and can catch pulses as narrow as 50 nanoseconds. Separate switch-selectable TTL/DTL and CMOS/HTL threshholds program the dual threshhold window comparator to separately drive the high and low LED indicators. A built-in pulse stretcher drives the third pulse LED. A pulse memory switch latches the pulse LED on at the leading edge (positive- or negative- going) of a single-shot low repetition-rate pulse and holds it on until the switch is reset.

The DP-1 Digital Pulser kicks out either single pulses or 100 Hz pulse trains with a push of its button. A



pulse-indicator LED confirms operation, while a TTL/CMOS mode switch selects the proper levels. Its output has enough kick to drive most signal lines without desoldering them. State-sensitive circuitry inside selectively triggers the proper half of its twin mirror output drivers to automatically drive a node to its complementary state.

The LM-1 Logic Monitor clips onto any standard 14-pin or 16-pin DIP IC. The state of each pin then appears on the topside of the LM-1, where 16 LEDs light for high levels, stay dark for low.

Accessories in the LTC-1 Standard Logical Analysis Kit include two 2½" probe tips, two 1½" probe tips, one 3" long "easy clip" adapter for use in place of the probe tip, one 3" ground lead with alligator clip, one test probe tip adapter (converts probe tip to "easy-clip") and one banana plug tip adapter.

CSC's LTC-1 Standard Logical Analysis Kit carries a suggested price of $208.10.

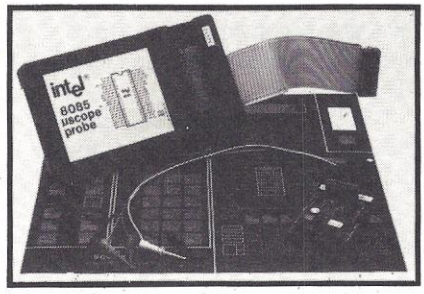
A second kit, the LTC-2 High Speed Logical Analysis Kit, sells for $235.05. The LTC-2 consists of a LP-3 Logic Probe, DP-1 Digital Pulser and DM-1 clip-on Logic Monitor, plus accessories

and documentation, housed in a carrying case.

For further information contact Continental Specialties Corporation, 70 Fulton Terrace, New Haven, CT 06509; (203) 624-3103. 351 California Street, San Francisco, 94104; (415) 421-8872. *Circle No. 288*

Troubleshooting Probe for 8085 Microcomputer Systems

Intel Corporation's new probe subsystem broadens the applications range of the μScope 820 Microprocessor Sys-



tem Console. With the new Probe 8085, the diagnostic instrument can troubleshoot systems based on 8085 and 8085A as well as 8080A microprocessors.

The μScope 820 is a portable, standalone instrument for troubleshooting microcomputer-based systems in lab, production test, repair-depot and field applications.

The Probe 8085 connects the console to the system under test via the microprocessor socket. The system continues operating during testing so total system operations can be diagnosed.

Used in combination with the console, the Probe 8085 allows you to simplify fault isolation by executing automatic diagnostic programs; enter detailed troubleshooting mode via the console's 32-bit wide break point, 128-byte overlay RAM memory and 256-level machine cycle trace memory; examine the actual flow of a program as each machine cycle is executed.

For more information contact Intel Corp., 3065 Bowers Ave., Santa Clara, CA 95051; (408) 987-8080. *Circle No. 287*

Microcomputer Programming

A low-cost microcomputer system about the size of a desk-top calculator and designed to provide an in-depth knowledge of how a microprocessor functions has been developed by Signetics.

Known as the Instructor 50, the self-contained training aid requires no additional power supply, teletype keyboard, display terminal or other equipment.

The Instructor 50 helps neophyte microprocessor users make an easy transition into the application of the Signetics 2650 and other microprocessors, according to Signetics. The unit includes step-by-step instructions and a pre-recorded cassette tape.

Users may input programs via the built-in Hexadecimal/Functional keyboard or enter previously recorded programs via the audio cassette interface.

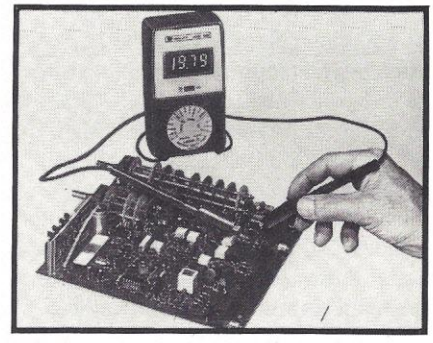
Users then execute programs using debugging aids provided on an internal monitor. A simple keyboard and 8-digit display are part of the unit. The Instructor 50 provides 512 bytes of RAM and an S100-compatible expansion bus so that other standard products – including additional memory or prototyping cards – can be used with the system.

The Instructor 50 is priced at $350 and is available from Signetics or its authorized distributors. For more information contact Signetics, 811 East Arques Ave., Sunnyvale, CA 94086; (408) 739-7700. *Circle No. 286.*

Pocket-size DVOM From Triplett

The new Model 3400 digital VOM (DVOM), introduced by Triplett Corp., includes Auto-Zeroing, Auto-Polarity, Auto-Low Battery and Auto-Overrange indication features. The 3-1/2 digit, 6 function, 24 range tester is designed for applications in electronic/electrical design, production, maintenance work, vocational technical training schools, television and communication equipment repair.

The 1/2" LCD display provides 3 readings per second at a full range of 1999 counts and the single dial type range selector simplifies usage. Overrange indication is shown with the dis-



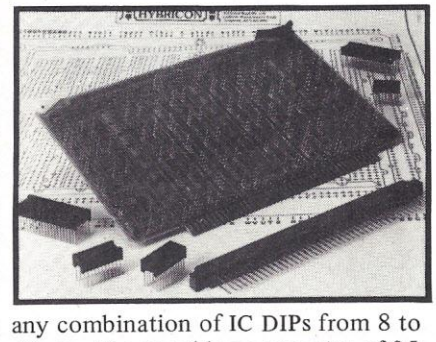
play completely blank except for 1/2 digit. Polarity indication is displayed during overrange condition. Reading rate is 3 readings per second.

The pocket-sized Model 3400 weighs 10 ounces with battery. Price is $140. For more information contact: Triplett Corporation, Dept. PR, 286 Harmon Road. Bluffton, OH 45817; (419) 358-5015. *Circle No. 155.*

Wire Wrap Panel for Motorola 6800 Microprocessor

A new Wire Wrap panel compatible with the Motorola 6800 microprocessor has been introduced by Hybricon Corp. The panel is dimensionally, I/O and bus compatible with the 6800MMA series. Versatility and density of the board permits its use in a variety of interface designs including memory, printer or single board computers used in the Micromodule family.

The 2-6800MMA panel features 52 columns of 43 contact holes per column on a 0.100" x 0.100" grid pattern with plated thru holes capable of mounting



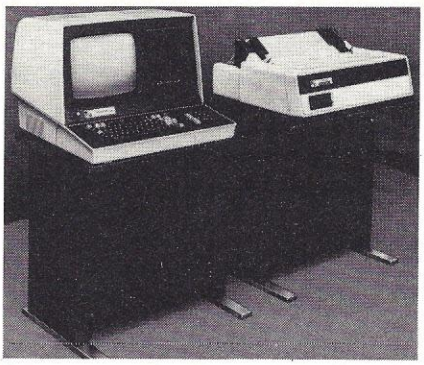
any combination of IC DIPs from 8 to 40 pin. The panel has a capacity of 95 16-pin DIPs and contains a combination of 10 uncommitted Vcc and Ground planes. The I/O structure in-

cludes 2 62-pin flat cable connectors and an 86-pin edge connector.

Pricing on the 2-6800MMA is $69.50, 1 to 3 pieces; and $63.50, 4 to 9 pieces. For more information contact D.F. Murphy, Marketing Manager, Hybricon Corp., 410 Great Road, Littleton, MA 01460; (617) 486-3174. *Circle No. 99.*

Micral CM Multiple Microcomputer System

R2E of America, the North American subsidiary of Realisations etudes electroniques has announced a multiple microcomputer system designed for sophisticated multi-terminal applications. The system consists of a Data File Management microcomputer and up to four independent microcomputer



stations, each with its own processor, I/O bus, serial I/O channel and local memory. Each microcomputer station can interface to a local or remote terminal, which can be a CRT display, an R2E Micral C Distributed Data Processing System or a Micral V Portable Microcomputer System.

The Micral CM is ideal for applications where data acquisition, computing and editing can be divided into several independent tasks, with one microcomputer per task. The tasks are linked by parameters passed through common memory. For example, each microcomputer can have an application program running in local memory with common subroutines and data available in shared memory.

Hardware consists of one 8080 based Data File Management microcomputer with 16K of RAM and up to four microcomputer stations with CPU, 4K of local RAM, serial communications channel and optional video display and keyboard. System resources include 48K of shared memory (expandable to 60K), CRT display and keyboard, two double-density minifloppy drives (with double-side recording optional), a Centronics parallel printer interface, and a 10 megabyte cartridge mididisk mass storage unit. System mass storage capabilities can be expanded to 80 megabytes, in 10 or 20 megabyte increments.

Standard system software includes a Monitor and Real Time Executive, macro assembler, Business Applications Oriented BASIC (BAL) with sequential, indexed sequential and random access file system; and utilities. Optional software includes an ANSI FORTRAN IV Compiler (FORT//80, licensed from Unified Technologies, Inc. of Toronto),

with editor, formatter and scientific subroutines.

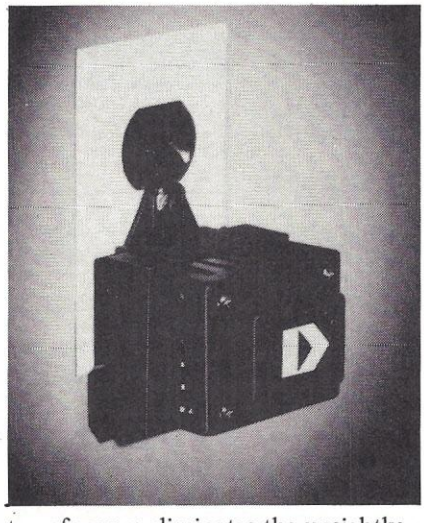
The end user price for the Micral CM, with one Data File Management microcomputer and one Microcomputer Station, is $21,250, including an optional CRT/keyboard. The introductory OEM price (50 units) is $17,000, with even greater volume discounts available. Deliveries are 60 days ARO from the plant in Minneapolis.

For more information contact R2E of America, 3406 University Ave., S.E., Minneapolis, MN 55414; (216) 562-9908. *Circle No. 177.*

Wall Plug-In Transformers

Dynamic Instrument has introduced a new standard line of high power wall plug in AC Step-Down Transformers that can be used instead of open frame transformers to power home computers security systems, microfiche readers, large electronic toys and games, lawn and garden systems and heating, ventilation and humidifying systems from 120 or 220 VAC. Two models, which produce 40 VA and 20 VA respectively at 6 volts, 12 volts, 16 volts or 24 volts AC or DC, are as small as present open frame transformers and smaller than most transformers with plastic housings.

Using plastic housed wall plug-in

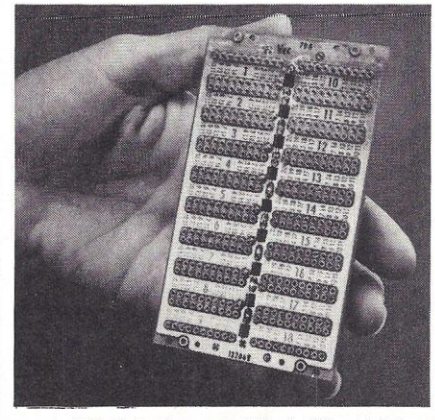


transformers eliminates the unsightly appearance and possible shock hazard of open frame transformers, the company said. The wall plug-in configuration, which keeps high power at the wall socket and allows only low-power current into the system, also eliminates heavy insulation requirements, wide spacing between live parts, UL/CSA recognized components, local electrical codes, heavy line cords, high voltage dielectric tests and heat from internal transformers.

For more information contact Dynamic Instrument Corp., 933 Motor Parkway, Hauppauge, NY 11787. *Circle No. 176.*

20-Pin Wire Wrap Board

A new wire wrap board for 20-pin memory ICs, developed by EECO, is designed to hold up to 18 ICs. The board is made of 0.062-inch, flame retardant glass epoxy. The socket pins



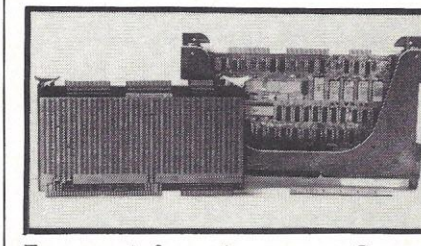
are gold plated over nickel. Nine high frequency ceramic and two low frequency tantalum capacitors combine with 2 ox copper for low impedance power distribution. The board can be mounted on any standard EECO 2D drawers, fixed or swing-out frames or large scale assemblies.

Part number designation is H-2968-01. Price is $65 each. Contact EECO, 1441 East Chestnut Ave., Santa Ana, CA 92701; (714) 835-6000. *Circle No. 154.*

Microprocessor Wire-Wrap Interface Board

A new SBC 80/10 80/20 Universal Microprocessor Interface Board, that plugs directly into the Intel SBC 604 Modular Cardcage/Backplane bus system, is now available from Garry Manufacturing Co. The board includes power interface connections for ±5 and ±12 volts DC.

Designated Part Number EPS 272-38-15, Garry's SBC 80/10, 80/20 Universal Wire-Wrap board provides 38 columns of 44 low-profile socket terminals per column, with alternate rows of committed ground and voltage wire-wrap terminations. It will accommodate up to 95 16-position IC chips or an equivalent mix of 14, 16, 18, 22, 24, 28 or 40-position IC chips. Prices range from $2 to $3 per IC position.



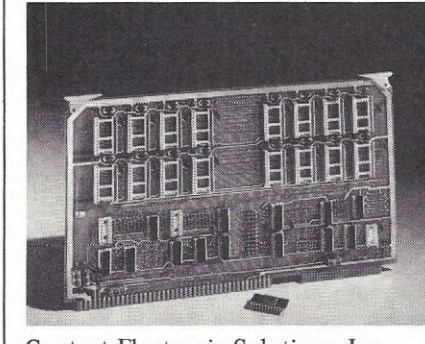
For more information contact Garry Manufacturing Company, 1010 Jersey Ave., New Brunswick, NJ 08902; (201) 545-2424. *Circle No. 152.*

16K PROM Board

Electronic Solutions' 16K PROM Board is compatible with Intel's SBC 80 Bus and Single Board Computer. The PROM-16 accepts sixteen 2708 EPROMs.

The Board's addressing scheme allows jumper selection of the Board Base Address at 0000, 2000, 4000, 8000, . . ., C0000 Hex. Any number of 1K memory addresses for the CPU, RAM memory, and so forth. When fully loaded with sixteen 2708 EPROMs, the Board draws typically 0.31 A (from 5 V), 0.48 A (from -5V) and 0.80 A (from +12 V).

The PROM-16 is priced at $195.

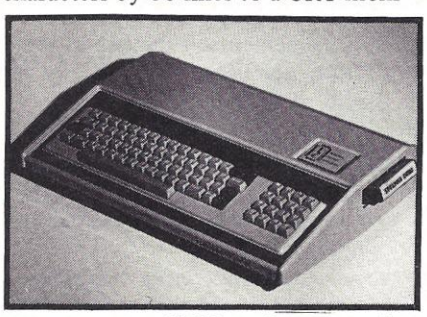


Contact Electronic Solutions, Inc., 7969 Engineer Rd., San Diego, CA 92111; (714) 292-0242. *Circle No. 282.*

PS-80 Personal Computer

Personal Systems Consulting is now marketing a new personal computer, manufactured by Exidy, Inc., through a network of independent consultants. Identified as the PS-80, the 8K, 16K and 32K RAM versions all feature full

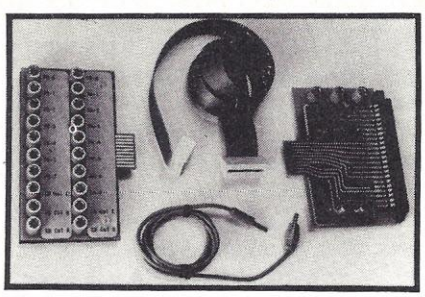
parallel port, RS-232 serial port and an S-100 expansion connector allowing interfacing to a full line of printers, flexible and hard disk and additional memory. The unit features a full upper/lower case, graphic keyboard with a 16-key numeric pad. A 4K byte PROM monitor provides control functions while languages and application packages can be changed by simply plugging in an 8K PROM cartridge conveniently packaged in an 8 track tape case. For home use, a dual cassette capability is provided allowing remote on-off and recording and reading at 300 or 1200 baud. A video out port channels 64 characters by 30 lines to a CRT monitor or converted TV receiver or modulated TV receiver. Up to 128 graphic characters can be user defined with 240 vertical by 512 horizontal points of resolution.



For more information contact Personal Systems Consulting, P.O. Box 20286, El Cajon, CA 92021; (714) 443-5353. *Circle No. 159.*

KIM Adaptors For Experimenters

The Technical Education Research Centers (TERC) nave developed two adaptors to the KIM-1 microcomputer for experimenters who need to breadboard special input/output applications. Called the KIM-1 Interface Sets, these make 20 I/O lines from the KIM available to either TERC's Modular Breadboarding System or to standard terminal strip breadboards. The adaptor connects directly to the KIM applications connector and also provides power, tape recorder and TTY connections.



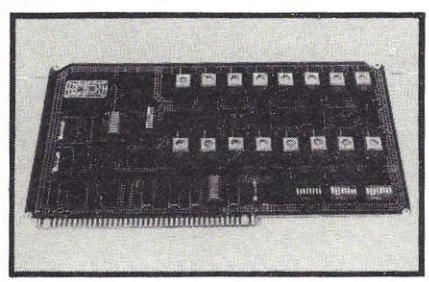
According to TERC, complex computer interfaces can be easily assembled and tested with this adaptor. TERC developed applications using this adaptor that permit data-logging with display, complex signal generation, timing functions and nuclear instrumentation with just the KIM and breadboarded I/O circuits. Software, course material and breadboards for these applications are also available.

A two board set is priced at $60. A single board with terminal strip adapter costs $36. For information contact TERC Services, 575 Technology Square, Cambridge, MA 02139; (617) 547-3890. *Circle No. 160.*

PROM/ROM Memory Module

An Intel Multibus /NSC-compatible memory module that accepts current and proposed 24-pin PROM/ROM devices was introduced by Datacube SMK, Inc.

Datacube Model DM-116 Data Rom is a PROM-ROM memory module with a selectable access time delay that permits it to accept erasable and fusible-link PROMs and masked ROMs in all current 24-pin standard and proposed formats from 1K x 8 to 8K x 8 bits. The module provides up to 128 kilobytes of PROM/ROM storage for Intel SBC/NSC BLC single board computers.



The unit provides sockets for sixteen 24-pin DIP devices, each is individually switch enabled. Data are selected by a 16-bit (optional 20-bit) address, and are presented on the bus as 8 or 16 bit words. A -5 V regulator for use with the Intel MDS-800 is optional.

The DataRom is priced at $265 each (1 to 9), and $160 each (100 to 499). For more information contact Datacube SMK, Inc., J. Dunn, Marketing, 670 Main St., P.O. Box 405, Reading, MA 01867; (617) 944-4600. *Circle No. 281.*

SOFTWARE

CRT to Produce Programmed Cassettes for Home Computers

A library of **programmed cassette tapes** for personal home computers is available from GRT Corporation, Sunnyvale, CA. The first tapes will be marketed through personal computer retailers and department stores nationally.

GRT manufactures cassette and eight track products for over sixty record labels, as well as its own record labels, and markets them through distributors and retailers in the U.S. and Canada. Computer programs will be offered on the GRT label. The company has worked with Microcomputer Software Associates of Hayward, CA, in developing a series of cassette programs for home users. Initial offerings will include the following programs: home finance, including checkbook balancing and loan amortization; stock option tracking; cash flow analysis; diet assistance and medical biorhythms; and several computer games including blackjack and bridge instruction.

For more information contact Carter Elliott, GRT Corp., 1286 Lawrence Station Rd., Sunnyvale, CA 94086; (800) 662-9810 (in California); (800) 538-1770 (elsewhere). *Circle No. 219.*

New H8 Software from Heath

Heath Company offers **additional software for the H8** Personal Computer. Extended Benton Harbor BASIC with file capability provides a faster, more powerful version of the BASIC provided with the H8. It includes character strings, math functions, dynamic storage allocation and access to a real time clock. Extended Benton Harbor BASIC requires 12K to 18K of memory and is available in audio cassette or paper tape form. Specify HC-8-13 (mail order price $20) for cassette and H8-14 (mail order price $10) for paper tape.

New games software for the H8 includes PA-82 Biorhythm, PA-83 Space War and PA-84 Game Set #1 (incorporating Craps, Orbit, Tic Tac Toe, Nim, Hexapawn, Hangman, Hmrabi and Derby). Biorhythm runs under Extended Benton Harbor BASIC and requires 16K of RAM. Space War and Game Set #1 require 24K and 8K of RAM respectively. The games are available in cassette form only and sell for $10 each (mail order). For information, write Heath Company, Dept. 350-580, Benton Harbor, MI 49022. *Circle No. 218.*

New 6800/6801/6802 Cross-Assembler by Wintek

Version 1.4 of Wintek's 6800 **Cross-Assembler** supports the ten new instructions for the Motorola 6801, thus allowing assembly of programs for the 6800, 1801 and 6802. It recognizes all the standard Morotola operation mnemonics and pseudo-ops, and produces a sorted symbol table and cross-reference map.

The Cross-Assembler can be used as a stand-alone assembler producing absolute object code in Wintek's Cross-Linker and PL/W compiler. By using the relocatable mode, the programmer may assemble his program in easily managed pieces and develop subroutine libraries which are then combined as needed by the Cross-Linker into a single program. Advanced listing controls, including title, subtitle, date, time, paging and spacing, and automatic formatting of the source program, help improve readability and documentation for later maintenance.

The Wintek 6800 Cross-Assembler is written in ANSI Standard X3.9-1966 FORTRAN and is available for any computer or minicomputer supporting an ANSI FORTRAN compiler. The source is available on magnetic tape for $800. Also available are the Cross-Linker ($400), Simulator ($800), PL/W compiler ($1400), and Floating-Point Arithmetic/Scientific Function library ($500). The complete package is available for $3400. For more information, contact Steve Belter, Wintek Corporation, 902 North Ninth St., Lafayette, IN 47904; (317) 742-6802. *Circle No. 222.*

Interactive Billing System for Clinics Announces by NCR

A new **medical system** which keeps track of treatments given patients in a doctors' clinic and prints summary reports for each physician as well as bills and statistical reports is now available from NCR Corporation.

NCR Interactive Clinic Billing System meets administrative and accounting requirements in medium-sized clinics and health-care group practices, according to the company.

Initial patient background information is entered via a visual display terminal. As various tests or treatments are given, information keyed into the terminal updates records immediately. At the end of the day, the system produces a report listing all activity and a breakdown of activity by each physician. During the day, patient files may be accessed by using the visual display terminal. Statements at the end of the month show the patient's balance and the details of all transactions that have occurred during the month. The system also provides information to assist the clinic in analyzing the activity by procedure, diagnosis, cost center and physician.

A typical system configuration includes an NCR I-8230 computer with 64K-byte memory, two visual display terminals, a 50-line-per-minute printer and a 10-million-byte-capacity disk rage unit. Such a system can process approximately 6500 patient accounts and maintain 3000 service codes and 75,000 detailed charges and payments. Doubling disk storage increases volumes threefold.

The system is available for immediate customer delivery. The one-time license fee for the software package is $3000. For more information contact NCR Corp., Dayton, OH 45479; (513) 449-2150. *Circle No. 221.*

BASIC Interpreter Designed for Business Applications

An extension of Dartmouth Version 6 Basic, ECD Business Basic meets **small business programming needs** with its array handling capabilities. Any array can have intermixed elements of variables, vectors, strings, or boolean values; a single array can contain a customer list with name and address, open account items, and indication of delinquent status. Dynamical allocation of all arrays elminates the need to dimension them, and is particularly useful when adding or deleting information from an existing array.

Other business oriented features include: variable names up to 80 characters long, a complete set of string handling functions for strings of unlimited length and graphics plotting capabilities. ECD Business Basic will also execute assembly language subroutines which can be used for special interfacing requirements when other devices need to be controlled by a Basic program. It contains the usual Basic instruction set, so it will also run scientific and other nonbusiness programs.

ECD Business Basic runs on the ECD 7X and Smart ASCII systems and uses about 20K of memory. Versions are available which use floppy discs, minicassettes or audio cassettes. ECD Business Basic is provided free of charge with any 32K 7X system, or Smart ASCII. For more information contact Richard Eckhardt, ECD Corp., 196 Broadway, Cambridge, MA 02139; (617) 661-4400. *Circle No. 223.*

Software for Language to Language Communication Announced

Increased power for small computer software allowing programs from one language to communicate with data from another language has been announced by Processor Technology Corporation.

This advance is made possible by the use of the Processor Technology Disk Operating System (PTDOS). Extended BASIC, FORTRAN, FOCAL and PILOT are among the high level languages which can communicate with each other using this standard data format.

According to PTC "a program running in FORTRAN can access data created in BASIC and then edit other data written in FOCAL."

PTDOS permits raw data created under its own text editor or assembler to be accessed by these high level languages. This feature simplifies the programming of complex data manipulation applications such as word processing.

PTDOS runs on Processor Technology Sol Systems which include the Sol-20 terminal computer with built-in keyboard and Helios II disk memory system. Integrated systems including PTDOS and Helios II start at $5995. For more information contact Technology Corp., 7100 Johnson Industrial Dr., Pleasanton, CA 94566; (415) 829-2600. *Circle No. 277.*

General Purpose Mailing Label Program

Mailing List is a general purpose **mailing label program** which enables users to start and maintain a mailing list. Operations include: Add, Delete, Search, Sorted List, Modify and Sequential Printout. Users are given the option of a Remark Field up to 64 characters long for any additional information which can then be used to sort or retrieve information. Users can also set up and change default printing formats controlling the exact placement of up to five labels across a page, whether or not to print the Remarks field and zip code placement. The program can be used without prior knowledge of computers.

Written in Disk BASIC for a PolyMorphic Systems 8810 or 8813, the complete program comes on diskette or as a hard copy list for $40. For more information, contact Software Industries, 902 Pinecrest, Richardson, TX 75080. *Circle No. 234.*

Accounts Receivable Order Entry System

Computerland offers a microcomputer Accounts Receivable/Order Entry System with option to interface directly to INCOME. To facilitate order entry, AROES allows orders to be placed for products or miscellaneous changes, checks inventory levels and backorders when necessary, deleting orders, prints invoices for all orders, checks backorders, and automatically adjusts Accounts Receivable with new invoices.

To aid accounts receivable, AROES builds and maintains customer master files, displays a listing of outstanding invoices, posts receipts, makes debit or credit adjustments, posts customer returns, shows sales for a specific day as well as sales territory, ages all outstanding receivables (0-30, 30-60, 60-90, 90-120 and over 120), clears files of all old records.

For more information, contact Computerland, 50 East Rand Rd., Arlington Heights, IL 60004; (312) 255-6488. *Circle No. 231.*

6500 Microprocessor Cross Assemblers

COMPAS has reduced prices on all its **cross assemblers** for the 6500 microprocessor family built by MOS/ Technology, Synertek and Rockwell. All cross assemblers now cost $600, which includes test programs and one year free support. Two versions of the cross assemblers are offered.

FORTRAN-based cross assemblers were formerly priced at $1200 and are available for IBM, CDC, Xerox and Honeywell computers. These cross assemblers conform to standards originally specified by MOS/Technology and include full cross reference capability. Normal distribution media is magnetic tape.

The MINmic 1165 cross assembler, formerly priced at $900, is available for any PDP 11 using the RT 11 operating system. The MINmic cross assembler is written in MACRO 11 for maximum speed and only requires 5K words memory. Normal distribution is on floppy disk or RK05 disk. This assembler may be used in conjunction with the CSL/65 cross compiler, which also runs on any similar PDP 11.

Brochures are available for all cross assemblers and a cross assembler manual is available for $5 (prepaid). For more information contact Mike Corder, Computer Applications Corp., 413 Kellog, Ames, IA 50010; (515) 232-8187. *Circle No. 220.*

Leasing Company Software

Promedics Data Corporation, a turnkey computer systems and software company, has announced a **lease management system** consisting of a series of programs intended for companies engaged in truck, car or equipment leasing. The software package helps the lease manager plan his cash flow and increase his control over all lease operations. The series of twelve programs can generate customer lease quotes, alphabetical customer lists, ledgers, billing statements, cash posting journals, past due reports, termination credit reports and a Note Payment Due Report.

The software is written in BASIC and runs on Z80/8080 based systems and PDP-11 systems using BASIC+2. The software is available to both end users and OEMs. The single user license fee is $1500; a complete turnkey system, including word processing and general ledger, is available for $13,500. For further information contact Promedics Data Corp., 1032 Elwell Ct. Suite 240, Palo Alto, CA 94303. *Circle No. 226.*

Micro Assembler for Bit Slice Microprocessors

A **micro assembler** to aid in microprogramming all popular bit slice microprocessors is now available from Philips. The Signetics Micro Assembler is a software package for the complete microprogramming cycle including defining microinstructions, writing and assembling programs, and generating paper tape output for ROM programming. In addition, the Micro Assembler permits flexible editing to speed debugging and program alterations through iterated loops, updates and replacements, and a built-in test program to check system accuracy.

The Micro Assembler is written in ANSI FORTRAN IV and can be run on any 16 or 32-bit computer with FORTRAN capability. In its present form, the micro assembly language provides direct support for the 3002 and 2901-1 bipolar microprocessors and the 8X02 Control Store Sequencer. Through the inclusion of explicit definitions, similar support can be obtained for the 3001 Microprogram Control Unit, as well as other bipolar processing elements and sequencers.

The Micro Assembler consists of two independent programs. The first reads the microprogram and the appropriate configuration and format descriptions written in the micro assembly language. It produces a listing of the source input and the resulting binary form of the microinstructions in the microprogram. The listing also includes diagnostics for errors found, and a cross-refererence for symbols used in the microprogram.

The second program punches paper tapes that can be used to program micro control-store PROMs. It reads an object form of the microprogram produced by the first program. The microprogram object is partitioned into PROM modules, and separate output is produced for each PROM.

For programming micro control-store PROMs, the program supports 2650 Absolute Object Code, SMS format and various BPNF formats. The 2650 Absolute Object Code can be read by the Signetics TWIN development system when it is used to program PROMs. The BPNF formats are used by most commercially available PROM programmers to burn micro store PROMs. The Micro Assembler is available in source form on 9-track magnetic tape. For more information, contact N.V. Philips Gloeilampenfabrieken, Elcoma Div., PO Box 523, 5600 AM EINDHOVEN – the Netherlands. *Circle No. 224*

8080 Taught to Speak English

Anglophone is an 8080 program which converts ordinary English in real time into phonetic codes to drive popular brands of speech synthesizers. Anglophone eliminates the need for hand-coding phonetic messages for speech synthesizers. Large data bases which would take years to hand code into phonetic notation are now instantly available for speech output.

Hardware needed includes an 8080 CPU, 8K bytes of memory and a speech synthesizer. Anglophone can be patched easily into any higher level programming language. Talking terminal software is available to convert an 8080-based intelligent terminal into a talking terminal for use on any computer system.

The $100 price includes source and object code on paper tape or cassette and a 120 page user's manual. For further information, contact Upper Case books, 502 E. John St., Champaign, IL 61820; (217) 384-4382. *Circle No. 232.*

KSAM File Management System

KSAM is a **file management system** designed for floppy disk microcomputer systems. Developed for large file applications requiring fast random access, KSAM features random storage and retrieval of records based on the contents of a user-defined data field within the record (called the key). The key must be unique for each record and it can be any string up to 255 characters long.

KSAM80 also supports sequential access of records starting at any point within a file, random access by partial key and random access by relative record number. Sequential and random access commands can be intermixed freely.

Space is automatically allocated to the file when records are added, and reclaimed when records are deleted, so the KSAM80 files are self-reorganizing, and any number of files can be processed simultaneously if sufficient buffer storage is available.

KSAM80's buffering techniques reduce the number of physical disk accesses necessary to retrieve records, thereby increasing retrieval speed and minimizing drive and media wear. In fact, the average retrieval time for any record is significantly less than the time required to perform the same access by track and sector address.

A number of utility programs are also available as part of the KSAM80 package. Originally developed under Zilog's Z80 OS 2.0 KSAM80 can be implemented in many microcomputer operating systems. For additional information contact EMS, 3645 Grand Av., Suite 304, Oakland, CA 94610; (415) 834-4944. *Circle No. 228.*

Percom Software Patch for SWTP 8K BASIC Adds Disk Data File Capability

PerCom Data Company announces a software patch that adds nine **disk data file commands and functions** to Southwest Technical Products' 8K BASIC. SWTP 8K BASIC is for 6800-based machines.

With a disk storage system such as PerCom's LFD-400 minifloppy, and the augmented 8K BASIC in memory, a user has the full capability to create and maintain disk data files.

The software patch is "overlaid" after 8K BASIC has been loaded in memory. This may be done either manually or from a PerCom diskette which includes the patch and a loader program. The modified BASIC takes up 10K bytes of memory.

The patch permits up to four data files to be active concurrently, and files may be formatted and updated "in place". Formatted files may be accessed randomly.

In addition to OPEN, CLOSE,

LOAD and SAVE commands, the program features special instructions that simplify data manipulation.

A special CHAIN instruction, which serves the same function as LOAD but causes the program to begin execution as soon as it is loaded, is useful for "chaining" programs together or for "overlaying" programs that would otherwise be too large to fit in memory as a single program.

Also included are RESTORE and SCTR functions. RESTORE closes the file specified by the user and reopens it again. SCTR returns the values of the drive and sector currently being manipulated.

Since purchasers of the software patch receive a complete program listing, the patch may be adapted to disk storage systems other than the PerCom LFD-400 minifloppy, although the patch was developed for the LFD-400.

A listing of the patch program and user instruction manual sells for $10; the listing, manual and diskette recording of the patch and patch loader for $15. For more information, contact PerCom Data Company, 318 Barnes, Garland, TX 75042. *Circle No. 233.*

Screen-Oriented Text Editor

Aox Associates announces Mate, a screen-oriented **text editor** for 8080 or Z-80 microcomputers with floppy disks running under ICOM or TDL FDOS. Mate simplyfies user interaction by dividing the screen into text display and command string sections. TECO-like command strings use iteration, conditional branching and macros to operate on 10 dynamically allocated buffers.

The independent text section of the screen instantly reflects any changes in the edit buffer, with text moving up and down, right and left, as commands modify the buffer. In another mode, keystrokes are directly entered on the screen and in the text. Mate can be used not only with a VDM-1, or similar video display board, but fast screen updates can also be obtained with a CRT terminal such as a Lear Siegler 'Dumb Terminal', because extensive display driver software utilizes the addressable cursor to make only necessary changes.

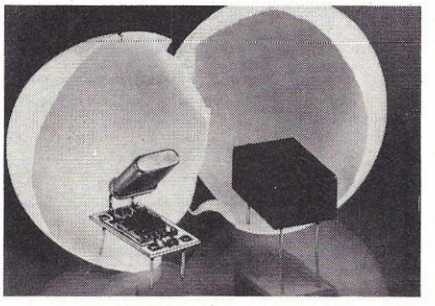
A wide variety of character, word, line and paragraph oriented commands are entered in the separately scrolling command section of the display. Command strings range in complexity from a single character through full text editing programs – complete with variables, numerical calculations, conditional jumps and comments – and can be freely formatted with spaces, tabs and carriage returns for clarity. A command string may be executed as a macro by storing it in one of the 10 buffers, saving it on the disk, or incorporating it as a permanent part of Mate. Macros can be nested, and receive string arguments from the calling command. Word processing facilities include an automatic line width formatting feature for both screen display and output printing, upper and lower case, and settable tab stops and margins.

Mate is available on 8" diskette for $49.50, including 9K bytes of object code for the editor, and object and source code for several popular screen, keyboard and printer drivers. The comprehensive user and interface manual (purchasable separately for $5, refundable with complete order) gives instructions to help adapt these drivers to other hardware. For further information, contact Michael Aronson at Aox Associates, PO Box 558, Somerville, MA 02143. *Circle No. 225.*

COMPLEMENTS

Crystal Clock Oscillator from De Amerteck Corp.

De Amertek Corp., introduced a line of **crystal clock oscillators** model XCO-H100. These units operate in a frequency range of 4 MHz and are designed for use in TTL output circuits.



The clock oscillators feature rise and fall times of 15 nanoseconds max. for operation in the 9 MHz to 20 MHz frequency range. Applications include communications, test equipment and data processing circuitry, the company said.

Compatible with standard units, the oscillators have 4 pins for convenient circuit board mounting. The can size measures 0.515" wide by 0.815" long.

Units are available within 2 weeks after receipt of order. Price range is $18 for small quantities to $6.50 in production lot orders. For more information contact Jack Chen, De Amertek Corporation, Inc., 1380 Jarvis Avenue, Elk Grove Village, IL 60007; (312) 640-1320. *Circle No. 190.*

American Microsystems, Inc., Introduces One Chip Video Display Generator

American Microsystems, Inc., is sampling a low-cost, one-chip **video display generator** compatible with S6800 and other 8-bit microprocessors and utilizing any commercially available RF modulator. The new device can generate 14 different types of display on American Standard television sets.

Designated the S68047 Video Display Generator, the circuit integrates four subsystems on a single chip that replaces up to 100 chips used in earlier television display systems. Timing and control, multiplexing, address buffering and shift registers are included in the device, along with an internal ROM which generates a 5x7 dot 64-character ASCII alphanumeric set.

S68047 output can be connected directly to the video circuit of a standard TV color monitor or, through an FCC-approved RF modulator, to the television antenna terminals.

Typical applications include instructional devices; customer information (such as arrival-departure schedules, point-of-sale terminals and inquiry systems); utility or process controls; safety, security and environmental controls; communications systems; routing and dispatching; and games and personal computers.

The 40-pin AMI S68047 Video Display Generator is priced at $11 in plastic and $14.55 in ceramic packages. For more information contact Tom Edel, Manager of Marketing Services, American Microsystems, Inc., 3800 Homestead Road, Santa Clara, CA 95051; (408) 246-0330. *Circle 188.*

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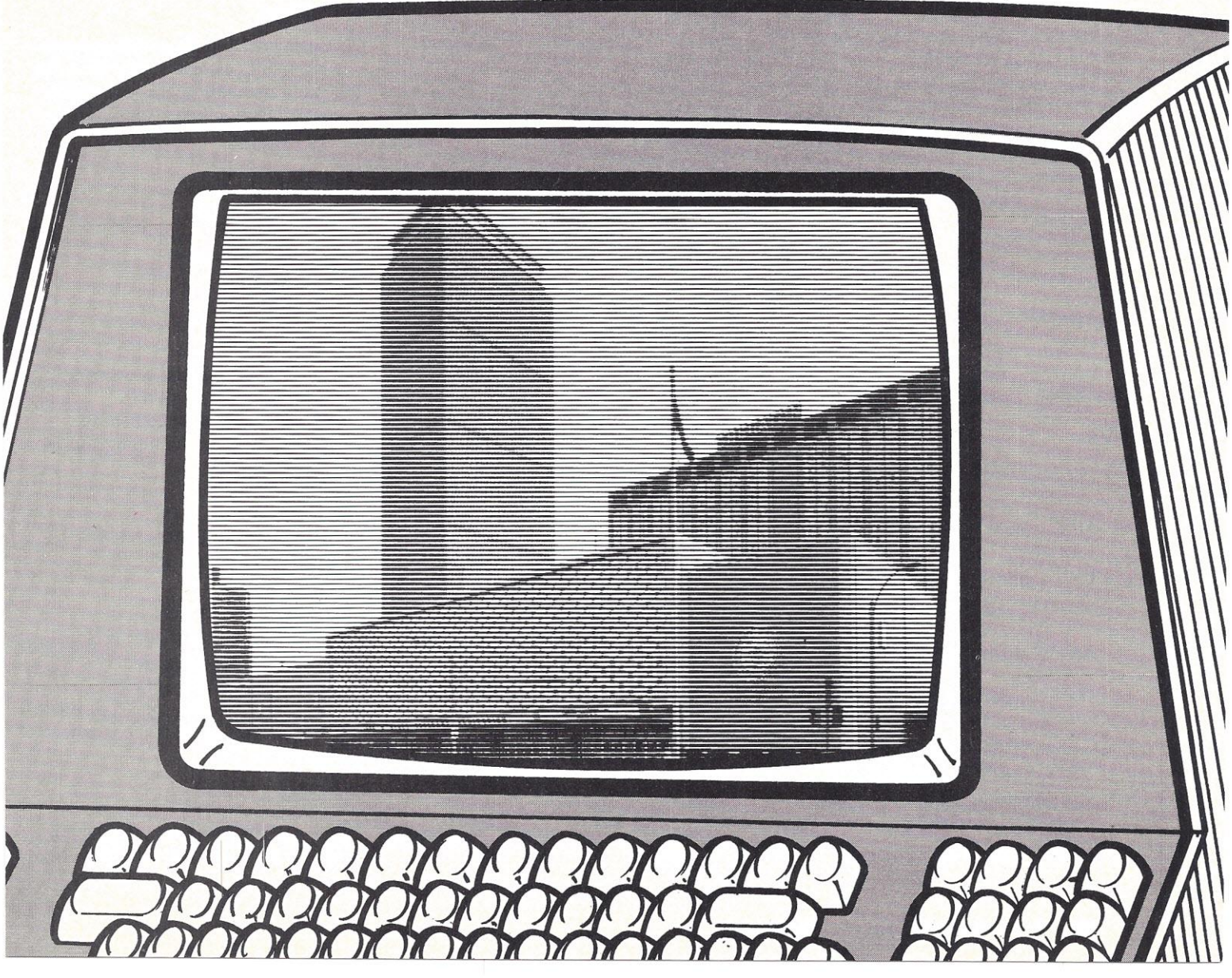
For more information call or write Northeast Expositions, Box 678, Brookline Village, Massachusetts 02147. Phone (617) 522-4467



Personal Computing Index

Is personal computing worth it?

We want your answers at the NCC '79 Personal Computing Festival. New York City, June 4–7

Has personal computing been worthwhile for you? Every aspect of this fast-growing field is being questioned...from the effort to generalize a subroutine to the cost of the latest hardware. What are your views?

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- Organize a panel
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The deadline for receipt of letters of intent to participate is February 1, 1979. Accepted papers will be published in the 1979 *NCC Personal Computing Proceedings.* Honors and prizes will be awarded for the best papers and application demonstrations.

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NCC '79

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How to Write for Personal Computing

Have you programmed your computer to converse in Gaelic? to do your home-ec homework? to read a bedtime story to the kids? Are you a frustrated fiction writer who's caught the computer bug? Or, have you found the ideal system or the absolutely worst combination of components?

Why not share your experiences with our readers? Yes, you too can write for *Personal Computing.* You choose the topic, *any* topic. If your topic relates to computers, great. If it relates to personal computers, even better. Computer hobbyists are looking for an excuse, any excuse, to buy a computer, and you might just offer the justification they're looking for.

We accept articles for all our sections – *Launching Pad* (our tutorial section for beginners), *On the Lighter Side* (where we print humorous applications), *In the Money* (how to use your computer to benefit financially), *Digging In* (for our more "advanced" topics), and *Once Upon a Time* (where we let your imagination run wild). We'd love to see some comparisons of computers or computer products. Tell us the good *and* bad of your system.

Keep your writing simple. No, our readers are not simpletons or beginners, but if you can explain something in simple words, do so. Don't clutter your piece with unnecessary jargon. If you're already into computers, give the newcomers a hand and let them in on some of the tricks of the trade – in simple terms. Examples, analogies, and charts and diagrams help both the beginner and the more advanced user appreciate what you're saying. Feel free to use "I" and "you" to make your article more personal and meaningful to the reader. Put the reader in the position of programmer ("you"). Also, please do not write your entire article in caps. And please indent for each paragraph.

Some things to note. Make sure your details are accurate – especially prices, other numerical information, and company names. Don't rely on hearsay or memory.

If you write about a program you've invented, try this order (to make sure you cover all angles): state the program's purpose; show a sample run; explain what the input options are, and what the output means; show another sample run; explain the underlying theory (if any); state the language, version, and computer you used and their peculiarities; show the listing; explain the program's over-all structure; analyze the program's details line by line; and suggest how the reader might improve or change the program.

Whatever your area of interest, you can turn it into an article. For example, if you're interested in watching birds then why not try an article on how to use a computer to track bird migrations? Or if your business is _____, why not try a piece on computers and how they can be used to _____ _____. We're open to ideas . . . .

If you've never written for a publication before and you'd like to discuss your piece with us before beginning it, give us a call. (Please do *not* mail us vague story proposals or outlines. We'd rather see the first few paragraphs of your article.) We'd be glad to discuss what you have in mind, and offer a few ideas of our own

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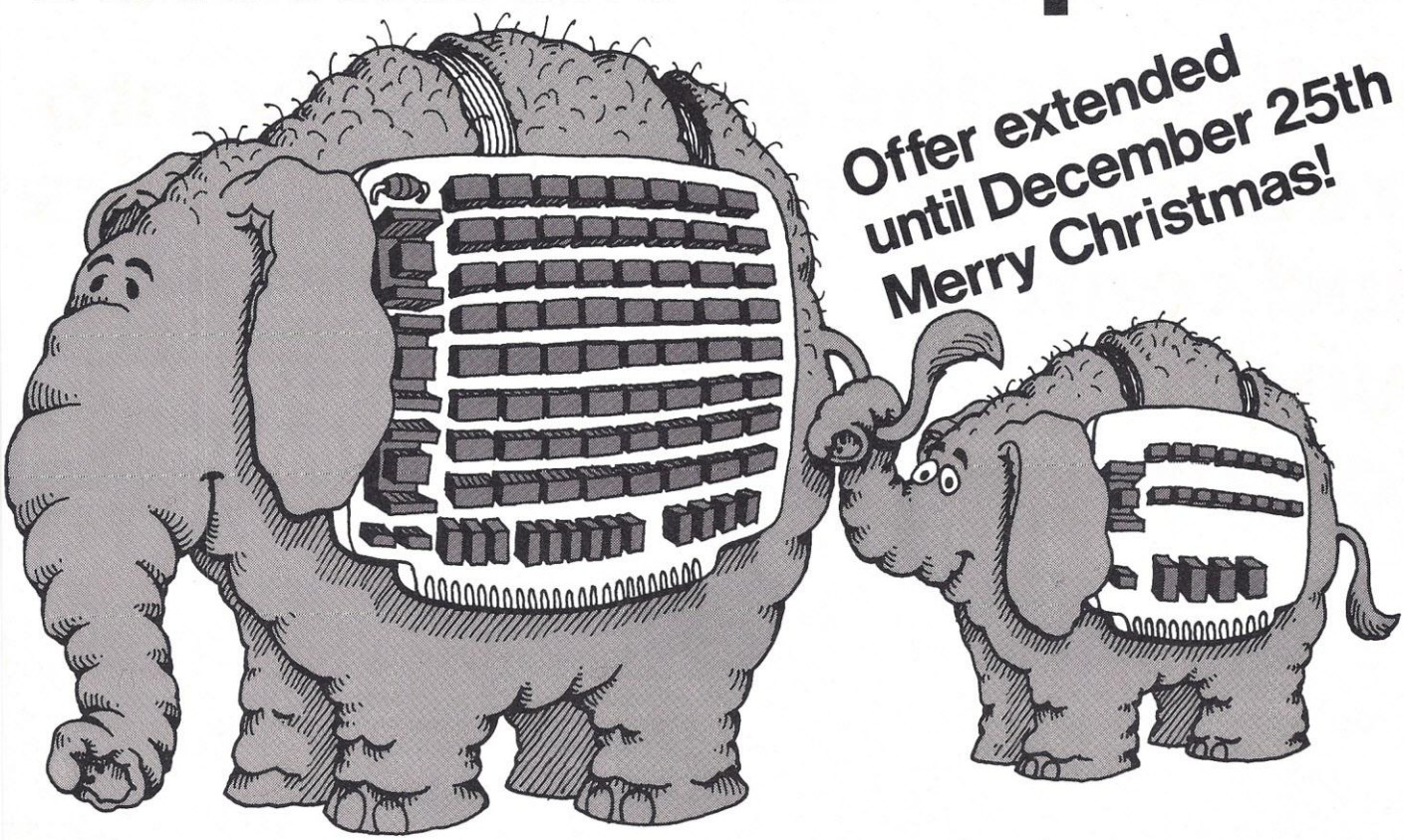
S-100 Memory for peanuts, Artec has slashed its prices!



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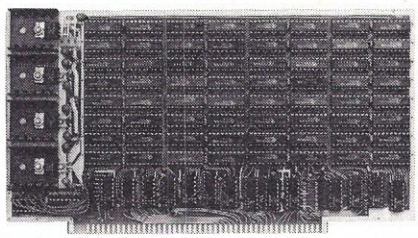

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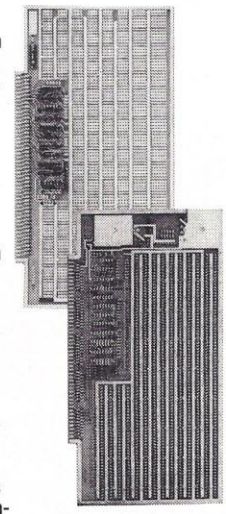

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CIRCLE 2

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CIRCLE 1